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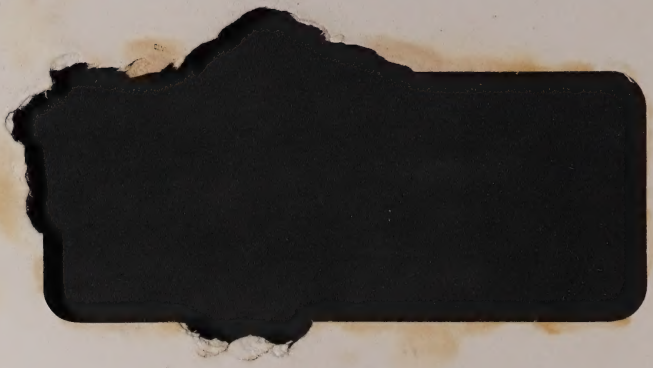
INSTRUCTION MANUAL

FOR

WJ-8718/1HZ OPTION

WATKINS-JOHNSON



INSTRUCTION MANUAL

FOR

WJ-8718/1HZ OPTION

WATKINS-JOHNSON COMPANY

700 QUINCE ORCHARD ROAD

GAITHERSBURG, MARYLAND 20760

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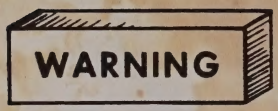

This equipment employs dangerous voltages which may be fatal if contacted. Exercise extreme caution in working with this equipment with any of the protective covers removed.

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1.1 FUNCTIONAL DESCRIPTION

The WJ-8718/1 Hz is an option for the WJ-8718 HF Receiver. When installed, this option allows the operator to tune to any frequency in the receiver's range with a resolution of 1 Hz. This function is accomplished by substituting a programmable phase lock loop (PLL) 3rd LO for the standard fixed 3rd LO, and modifying the digital tuning control and display circuitry to accommodate the additional digit of tuning resolution. The standard fixed 3rd LO is disabled, and its 50 kHz reference frequency is supplied to the new programmable 3rd LO.

1.2 ELECTRICAL CHARACTERISTICS

The circuitry of the 1 Hz option involves four circuit boards. Three of these boards contain the digital control and display circuitry, and each of these replaces a standard circuit board in the receiver. The fourth board is entirely new and is installed in an edge connector in the A6 motherboard. This board contains the variable 3rd LO circuit. The replacement of standard circuit boards by 1 Hz Option boards is summarized in Table 1-1. Figure 1-1 shows the location of the 1 Hz Option boards in the WJ-8718 Receiver.

Table 1-1. Circuit Board Locations

Standard WJ-8718 Receiver Circuit Board	WJ-8718/1 Hz Option Circuit Board
Type 791575 (-1 or -2) Manual Tuning Up/Down Counter (A6A1)	Type 796014 Manual Tuning Up/Down Counter (1 Hz-A1) is installed in the same location (A6A1)
Type 791578 Frequency Display (A8)	Type 796008 Frequency Display (1 Hz-A3) is installed in the same location (A8)
Type 791874-1 Manual Tuning Module (A7)	Type 791874-2 Manual Tuning Module (1 Hz-A4) is installed in the same location (A7)
No similar standard board	Type 796022 1 Hz Tuning 3rd LO (1 Hz-A2) is installed in an open slot (edge connector) on I/O Motherboard A6

The first three option boards in Table 1-1 (1 Hz-A1, 1 Hz-A3, and 1 Hz-A4) are variations of the corresponding standard boards, and use similar logic circuitry. The Manual Tuning Up/Down Counter uses CMOS logic operating at +5 volts, while the 1 Hz Tuning/3rd LO uses TTL divider circuitry.

The 1st and 3rd LO/Time Base board is modified for the 1 Hz Option, so as to disable the standard fixed 3rd LO and supply the 50 kHz reference frequency to the former 3rd LO output. The modified board is designated type 791600-2.

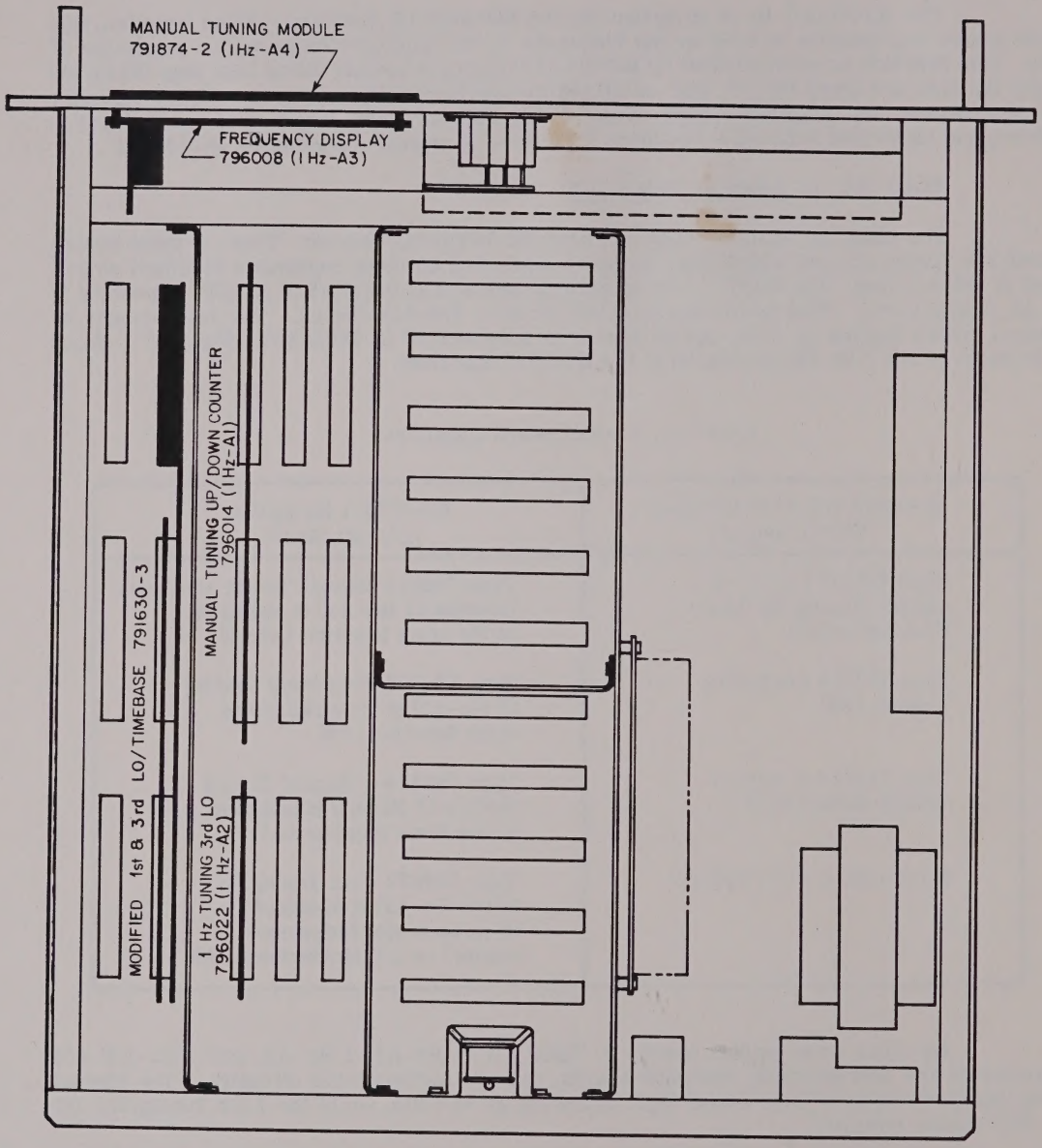


Figure 1-1. Location of 1 Hz Option Assemblies

1.3 MECHANICAL CHARACTERISTICS

The four printed circuit boards comprising the 1 Hz Option are all installed in existing edge connectors in the receiver. The type 796014 Manual Tuning Up/Down Counter (1 Hz-A1) is installed in location A6A1. Cable 1 Hz-W3 carries the 10 tuning data to the type 796022 (1 Hz-A2) 1 Hz Tuning 3rd LO board. This board can be installed in any of the three rear edge connectors on I/O Motherboard A6, depending on which connectors are already occupied by other options. Cable 1 Hz-W2 carries the 50 kHz reference signal from the Time Base circuits on A5A1. An existing main chassis cable (W8) is used to supply the 50 kHz reference to main chassis jack J9. Cable 1 Hz-W1 carries the 3rd LO signal from the 1 Hz Tuning/3rd LO board to chassis jack J7, from which it is applied to the 10.7 MHz/455 kHz Converter, A4A2. Frequency Display 796008 (1 Hz-A3) is installed in location A8, and uses the existing data cable to the Up/Down Counter board. Manual Tuning Module 791874-2 (1 Hz-A4) is installed in location A7 and is supplied with its own data cable to connect to the Up/Down Counter board.

1.4 EQUIPMENT SUPPLIED

The equipment supplied consists of four circuit board modules (1 Hz-A1, -A2, -A3, and -A4) and three interconnecting cables (1 Hz - W1, -W2, and -W3).

1.5 INSTALLATION

The following procedure describes the installation of the 1 Hz Tuning Option in a basic WJ-8718 Receiver. Refer to Figure 1-1 for the proper location of the 1 Hz Option boards in the WJ-8718 main chassis. It is assumed that the 1 Hz Tuning 3rd LO board may be placed in I/O Motherboard slot 9. However, if this slot is already occupied by another option board, the 1 Hz Tuning 3rd LO board may be placed in either slot 3 or 6, and the wiring procedure suitably modified.

1.5.1 PARTS REQUIRED

Table 1-2 lists the parts required to install the 1 Hz Option. Items listed with part numbers are available from Watkins-Johnson Company.

Table 1-2. Parts Required for 1 Hz Option Installation

Item	Part No.	Quantity
Manual Tuning Up/Down Counter	796014	1
1 Hz Tuning 3rd LO	796022	1
Frequency Display	796008	1
Bezel, Manual Tuning Module	34390-4	1
Cable Assembly	380050-1	1
Cable Assembly	380050-2	1
Cable Marker	380037-5	1
Screw, PHM, 4-40 x 1/2		5
Screw, PHM, 6-32 x 7/16		4
Washer, lock No. 4		5
Washer, plain No. 4		5
Washer, lock No. 6		4
Washer, plain No. 6		4
Wire, No. 30 Insulated Wire-wrap		A/R

1.5.2 DISASSEMBLY OF WJ-8718

1. Remove the top and bottom covers from the WJ-8718 Receiver.

2. Locate Front Panel Interconnect (A6A2), 791828, mounted on I/O Motherboard (A6) in the WJ-8718 Receiver. Loosen A6A2 board from A6 PC connectors. Disconnect cable connector A10P1 from right angle board connector A6A2P1 and move aside. Remove A6A2 board from receiver.

3. Locate Manual Tuning Up/Down Counter (A6A1), 791575, mounted on I/O Motherboard (A6) in the WJ-8718 Receiver. This board may be a -1 or -2 assembly. Perform one of the following procedures.

   A. If the A6A1 board is Manual Tuning Up/Down Counter, 791575-1, loosen board from A6 plug-in connectors. Disconnect cable connectors A8P1, A9P1, and A7A1P1 from right angle board connectors A6A1J2, A6A1J3, and A6A1J4, respectively. Move cable connectors aside and remove A6A1 board from receiver.

   B. If the A6A1 board is Manual Tuning Up/Down Counter with Remote Input, 791575-2, locate cable connector A6A1J1, mounted at rear panel position marked "REMOTE INPUT". Remove A6A1J1 by removing securing nuts, lock washers, flat washers, and screws. Fish cable to A6A1 board. Loosen A6A1 from A6 plug-in connectors. Disconnect cable connectors A8P1, A9P1, and A7A1P1 from right angle board connectors A6A1J2, J6A1J3, and J6A1J4, respectively. Place cable connectors aside and remove A6A1 board from receiver.

4. Locate 1st and 3rd LO Synthesizer/Time Base Assembly (A5A1), 791630, mounted on Synthesizer Motherboard (A5) in the WJ-8718 Receiver. Disconnect connector A5A1A2P1 from main chassis receptacle J4. Remove A5A1 board from receiver and set aside for modification.

5. Locate Manual Tuning Module (A7), 791874, mounted on the front panel. Remove the four 6-32 securing screws and retain for assembly. Disconnect Tuning Resolution ribbon cable from connector A6A1J4. Remove A7 module and set aside for modification.

6. Locate cable assembly W6 at the rear of the I/O section. Cable assembly W6 connects main chassis receptacles J7 and J9. Remove cable assembly W6. This cable assembly is not used with the 1 Hz Tuning Option, but should be retained for re-assembly.

7. Remove six mounting screws located at the front panel handles and remove the front panel assembly. Retain this assembly and the handles for reassembly.

8. Remove Frequency Display (A8), 791578, from the front panel assembly. The assembly is not used with the 1 Hz Tuning Option, but should be retained for future reassembly. Retain mounting hardware for reassembly.

1.5.3 MODIFICATION OF 1st AND 3rd LO/TIME BASE

1. Locate and remove 1st and 3rd LO/Time Base Assembly, 791630 (A5A1). Remove cable connector A1P1 from receptacle A2J1, located on upper left corner of PC board 791600 (A5A1A1). Remove six sets of No. 4 hardware securing PC board 791600 to 791630 assembly.

2. After carefully positioning PC board 791600 to prevent breakage of connecting wires, unsolder and remove capacitor C36 and fixed coil L3. Refer to Figure 1-2, detail A. These components are not required for the 1 Hz Tuning Option.

3. Prepare a 1.9 inch piece of No. 30 insulated wire-wrap wire by stripping both ends 1/2 inch.

4. Wrap and solder one end of No. 30 insulated wire-wrap wire to U21, terminal 11. Refer to Figure 1-2, detail B for location.

5. Remove solder from terminal E10. Feed free end of No. 30 insulated wire-wrap wire up through terminal E10, form bare wire end over top edge of terminal and trim approximately 1/16 inch below terminal edge. Fill terminal E10 with solder. Clean 791600 board thoroughly.

6. Carefully reposition 791600 board on 791630 assembly and secure with six sets of No. 4 hardware removed in step 1. Reconnect cable connector A1P1 to receptacle A2J1.

1.5.4 DISASSEMBLY OF MANUAL TUNING MODULE

1. Unsolder and disconnect four wires attached to encoder assembly 34836-1 (A7U1), and Tuning Resolution 791589 (A7A1).

2. Remove the tuning knob from encoder assembly 34836-1 and retain for reassembly.

3. Remove mounting nut and lock washer from encoder assembly 34836-1 and retain for reassembly. Remove encoder assembly 34836-1 and retain for reassembly.

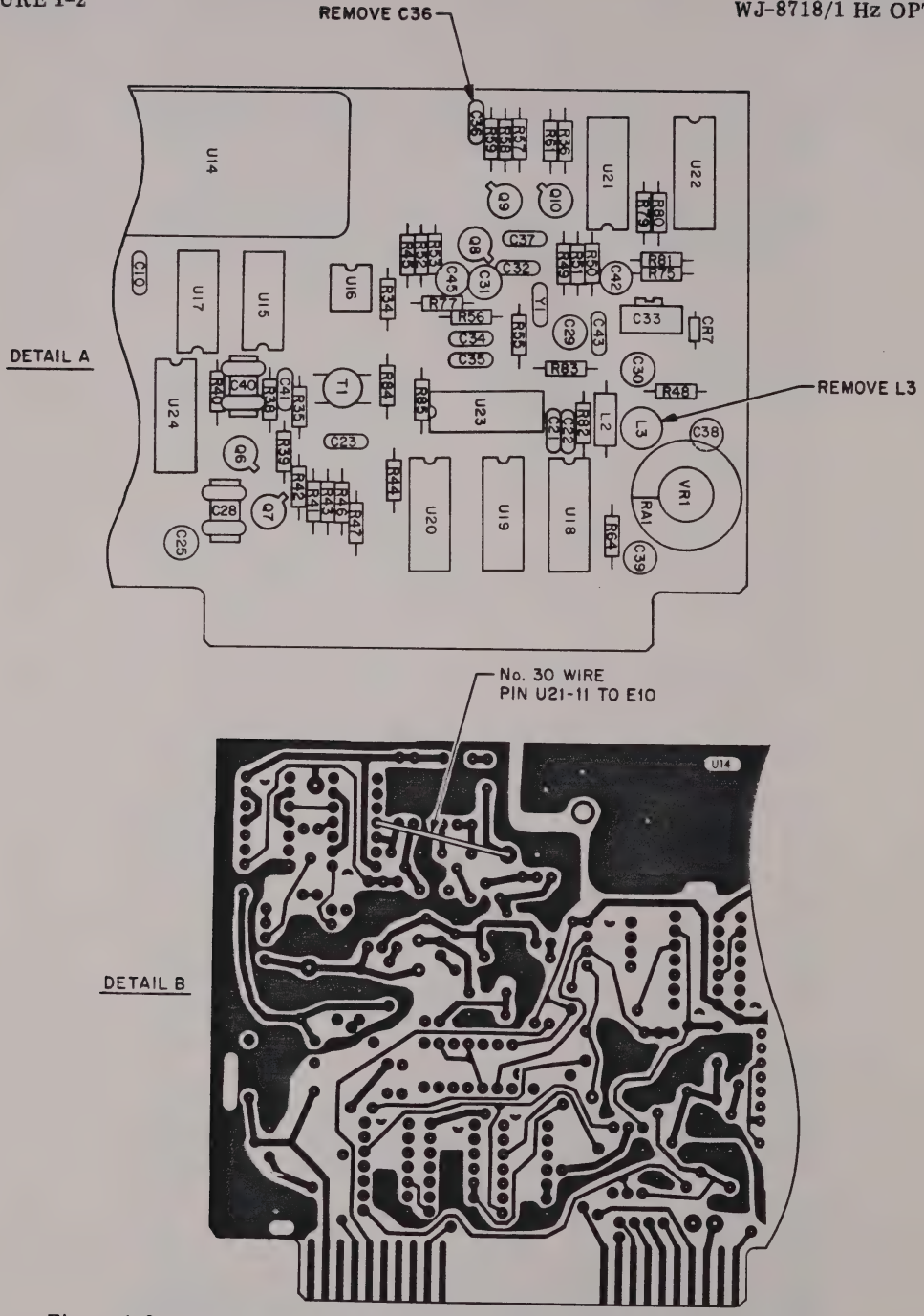


Figure 1-2. Modification of 1st and 3rd LO/Time Base, 791600 (A5A1A1)

4. Remove two 2-56 screws from Tuning Resolution 791589. Carefully remove actuator bar. Retain screws and bar for reassembly.

5. Remove Tuning Resolution 791589 and set aside for possible modification.

6. Separate the Manual Tuning Module panel 34952-1 from pan bezel. Retain the panel for reassembly. The bezel is not used with the 1 Hz Option.

1.5.5 MODIFICATION OF TUNING RESOLUTION

1. Locate Tuning Resolution (A7A1), 791589, which was removed for possible modification in paragraph 1.5.4, step 5. Check revision level letter designation which is etched on the printed circuit board with an etched circle around it.

NOTE

If revision level is D or above, disregard the remainder of paragraph 1.5.5 and continue the Tuning Resolution modification with paragraph 1.5.6. If revision level is C or B, Tuning Resolution 791589 must be modified as instructed, starting with paragraph 1.5.5, step 2.

NOTE

Refer to Figure 1-3 for representation of the following modification instructions.

2. On left side of Tuning Resolution board, cut the circuit track immediately below pad marked "C" in two places, approximately 1/32-inch apart. Strip circuit track between cuts and tin edges of bare copper (Figure 1-3).

3. On left side of Tuning Resolution board, cut circuit track immediately to left of pad marked "E1" in two places, approximately 1/32-inch apart. Strip circuit track between cuts and tin edges of bare copper.

4. Cut and strip a length of No. 30 insulated wire-wrap wire. Wrap and solder one wire end to paddle board terminal at pad marked "E1". Lay other wire end on circuit track separated from pad marked "C" by cuts made in step 2.

5. On right side of Tuning Resolution board, cut circuit track between pads marked "E13" and "E16" in two places, approximately 1/32-inch apart. Strip circuit track between cuts and tin edges of bare copper (Figure 1-2).

6. On right side of Tuning Resolution board, cut circuit track immediately to the right of pad marked "E13" in two places, approximately 1/32-inch apart. Strip circuit track between cuts and tin edges of bare copper.

7. On right side of Tuning Resolution board, cut circuit track immediately to right of pad marked "D" in two places, approximately 1/32-inch apart. Strip circuit track between cuts and tin edges of bare copper.

8. Cut and strip a length of No. 30 insulated wire-wrap wire. Wrap and solder one wire end to paddle board terminal at pad marked "E16". Lay other wire end on circuit track immediately to left of pad marked "D". Solder wire end to circuit track.

9. Cut and strip a length of No. 30 insulated wire-wrap wire. Wrap and solder one wire end to paddle board terminal at pad marked "E13". Remove solder from interfacial feedthru hole separated from pad marked "D" by cuts made in step 7. Place other wire end through open interfacial feedthru hole and solder. Trim wire extending through opposite side of interfacial feedthru hole and tin end of wire. Clean Tuning Resolution board thoroughly with fluorcarbon or hydrocarbon solvent.

CAUTION

DO NOT ALLOW SOLVENT INTO THE SWITCH MECHANISM. REMOVAL OF SWITCH LUBRICANT WILL BE DETRIMENTAL TO SWITCH OPERATION AND WILL CAUSE REDUCTION OF MTBF.

10. Remove and discard cable assembly 34510-99, marked "A7A1P1 (A6A1J4)". Replace with cable assembly WTW1214, marked "1 Hz-A4A1P1 (1 Hz-A1J4)". Mark Tuning Resolution board "791589-3".

1.5.6 MODIFICATION OF MANUAL TUNING MODULE

1. Locate panel 34952-1 with two 2-56 standoffs attached. This panel was retained for reassembly in paragraph 1.5.4, step 6.

2. Install modified Tuning Resolution 791589-3 and encoder assembly 34836-1 onto panel.

3. Install actuator bar between switch and panel standoffs. Secure switch with two 2-56 screws.

4. Locate panel bezel 34390-4 and mount onto panel 34952-1. Secure bezel in place using lock washer and mounting nut removed from encoder assembly 34836-1 in paragraph 1.5.4, step 3. Install encoder knob.

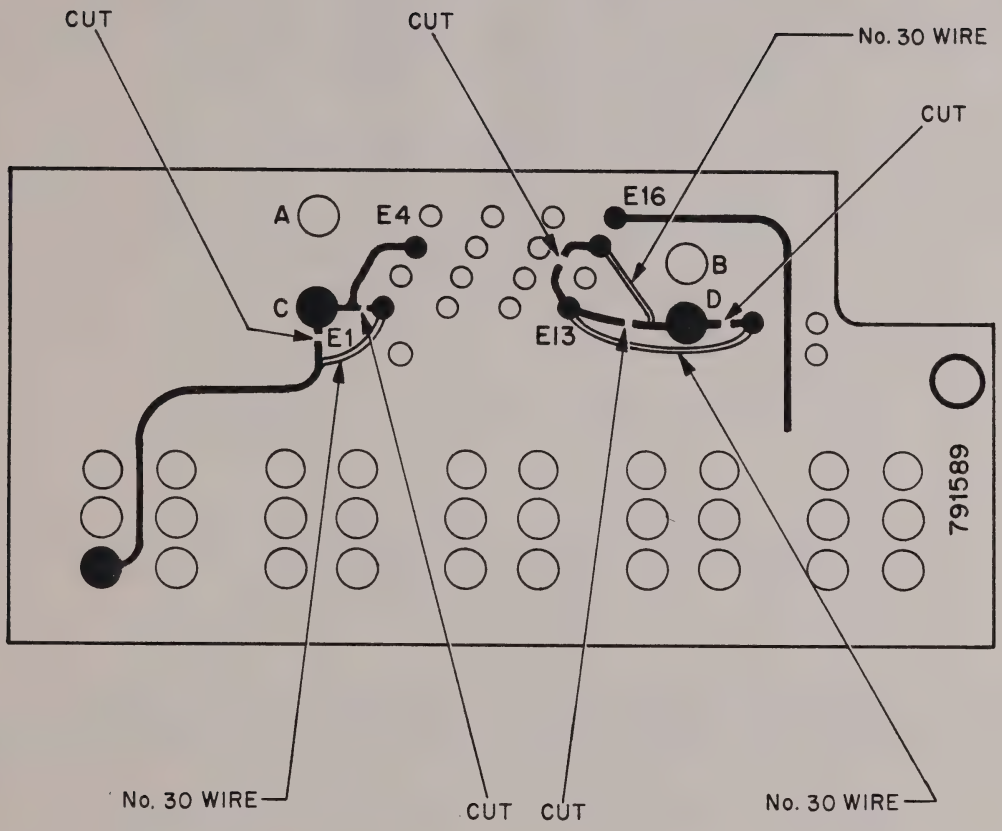


Figure 1-3. Modification of Tuning Resolution, 791589 (A7A1).

5. Rewire encoder assembly 34836-1 to modified Tuning Resolution 791589-3 as follows:

   A. Install and solder open end of yellow wire attached to encoder terminal "A" to pad marked "B" on Tuning Resolution board.

   B. Install and solder open end of orange wire attached to encoder terminal "B" to pad marked "A" on Tuning Resolution board.

   C. Install and solder open end of black wire attached to encoder terminal "C" to pad marked "C" on Tuning Resolution board.

   D. Install and solder open end of red wire attached to encoder terminal "D" to pad marked "D" on Tuning Resolution board.

1.5.7 ASSEMBLY OF WJ-8718/1 Hz OPTION

1. Locate Frequency Display 796008 (A8), and install on front panel using mounting hardware retained in paragraph 1.5.2, step 7.

2. Mount front panel onto chassis. Replace front panel handles retained in paragraph 1.5.2, step 6. Secure assembly by passing six screws retained in paragraph 1.5.2, step 6 through front panel handles and front panel and tightening screws into side plates. Fish connector 1 Hz-A3P1 on A8 cable assembly into I/O Motherboard area near slot 7.

3. Locate Manual Tuning Up/Down Counter 796014 (1 Hz-A1). Position 796014 Up/Down Counter in I/O Motherboard area near slots 7 and 8. Up/Down Counter receptacles J4, J2, and J3 should be positioned toward the receiver front panel.

4. Locate and install BFO switch cable connector A9P1 on bottom Up/Down Counter receptacle (J3).

5. Locate and install Frequency Display cable connector A8P1 on center Up/Down Counter receptacle (J2).

6. Locate and install modified Tuning Resolution cable connector 1 Hz-A4A1P1 on top Up/Down Counter receptacle (J4).

7. Install 796014 Manual Tuning Up/Down Counter on I/O Motherboard, slots 7 and 8.

8. Locate and install 1 Hz Tuning 3rd LO assembly 796022 (1 Hz-A2), on I/O Motherboard, slot 9, with component side facing chassis partition.

9. Locate and install modified 1st and 3rd LO/Time Base assembly, 791630-3, on Synthesizer Motherboard in PC connectors next to chassis partition. Attach connector A5A1P1 to receptacle J4.

10. Position receiver bottom side up. In the I/O Motherboard area, install the following parts:

    Install cable assembly 1 Hz-W1 on slot 9 (1 Hz-XA2). Attach connector 1 Hz-P2 to 1 Hz-XA2, terminals 3 and 4, with shield ground to terminal 4. Attach connector 1 Hz-P4 to chassis connector J9, located on partition.

11. Prepare four, 5-1/2-inch long, No. 30 insulated wire-wrap wires by stripping 1/2 inch from each end.

    A. Wrap one end of 1st wire to 1 Hz-XA1A, pin 48; wrap other wire end to 1 Hz-XA2, pin 48.

    B. Wrap one end of second wire to 1 Hz-XA1A, pin 46; wrap other wire end to 1 Hz-XA2, pin 46.

    C. Wrap one end of third wire to 1 Hz-XA1A, pin 44; wrap other wire end to 1 Hz-XA2, pin 44.

    D. Wrap one end of fourth wire to 1 Hz-XA1A, pin 42; wrap other wire end to 1 Hz-XA2, pin 42. Installation of WJ-8718/1 Hz is now complete.

1.6 OPERATION

The 1 Hz Option Manual Tuning Module (1 Hz-A4) provides five pushbuttons to select the desired tuning resolution, ranging from 10 kHz down to 1 Hz. The button depressed selects the lowest RF digit that will be affected by rotating the manual tuning knob. Therefore, when 1 Hz is selected, all RF digits are affected by tuning.

1.7 CIRCUIT DESCRIPTION

1.7.1 GENERAL

The basic tuning scheme of the receiver is slightly changed by the addition of the 1 Hz tuning option. Refer to Figure 1-4. The Input Converter module still translates the tuned RF to the 10.7 MHz IF, using LO frequencies supplied by the 1st, and 2nd LO Synthesizer circuits (refer to the basic WJ-8718 manual for a description of this process). However, the fixed 3rd LO (11.155 MHz) is no longer used to convert the 10.7 MHz IF to the 455 kHz IF. Instead, a programmable PLL synthesizer (type 796002) is used to supply a variable 3rd LO signal (11.154991 MHz to 11.155000 MHz) to the 10.7 MHz/455 kHz Converter, A4A2. The center frequency of the converted RF in the 455 kHz bandpass can, therefore, be shifted over a 10 Hz range, in 1 Hz increments. Since the tuning control logic and display boards are very similar to the standard ones described in the basic WJ-8718 manual, the differences will be discussed in the following subparagraphs. A separate detailed description for the new 1 Hz Tuning/3rd LO circuit board is provided in paragraph 1.7.2.

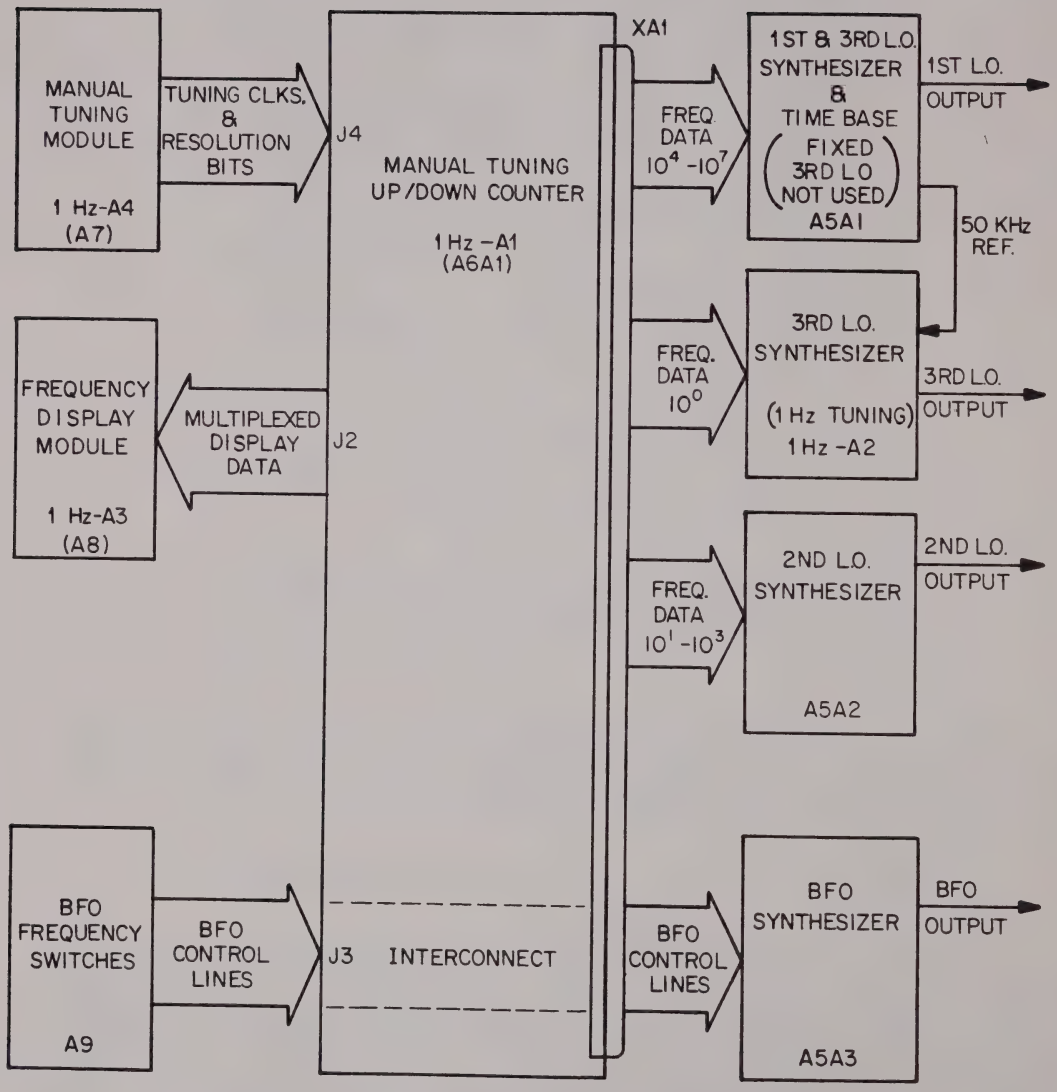


Figure 1-4. WJ-8718/1 Hz Option Functional Block Diagram

The description of the RF tuning logic provided in the basic WJ-8718 manual under the heading "DIGITAL CONTROL SECTION" is also generally applicable to the WJ-8718/1 Hz Option. Refer to Figure 1-4. The Manual Tuning Up/Down Counter used in the 1 Hz Option (type 796014) has one additional decade (U19) added to the counter chain. Since the 1 Hz digit (10^0) is the least significant digit, the significance of decades U2 through U5 has been shifted downward by one digit, such that the U2 bits now represent 10^0 instead of 10^1. The BCD output from this decade counter is supplied to the new 1 Hz 3rd LO circuit board, via edge connector pins A42, A44, A46, and A48. Another NAND gate (U18D) has been added to the step select circuitry, and the significance of the existing step select lines has been shifted downward by one digit to correspond with the decade counters. Thus, J4 pin 2 now selects the 10^0 step instead of 10^1. The J4 control line formerly used to select remote parallel frequency loading (pin 5) now serves as the 10^4 step select. This allows the configuration of the Manual Tuning Module to remain basically unchanged. Refer to schematic Figure 1-15. Switch S1A of the Tuning Resolution board (type 791589-3) now selects the 10^4 step, while S1E now selects 10^0.

The wiring of the display encoding circuitry on the Manual Tuning Up/Down Counter board (U12 through U16) is also changed in the 1 Hz version. Refer to schematic Figure 1-12. The least significant bit supplied to the data selectors (U12 through U15) now represents the 10^0 digit. Therefore, the code 000 from binary counter U16 now signifies that the 10^0 bits are present at the outputs of the U17 buffers. The U17 bits and the U16 code are supplied to the Frequency Display module for decoding and display. The relationship between the U16 codes and the corresponding U17 output bits is detailed in Table 1-3.

Table 1-3. Frequency Display Codes

U16 Code			U17 Output Digit
Q2	Q1	Q0	(2^3, 2^2, 2^1, 2^0)
0	0	0	10^0
0	0	1	10^1
0	1	0	10^2
0	1	1	10^3
1	0	0	10^4
1	0	1	10^5
1	1	0	10^6
1	1	1	10^7

The 1 Hz version of the Frequency Display board (type 796008) is also changed to accommodate the 10 digit. An additional LED display (U11) has been added, and another buffer (U10H) is used to control the common cathode pin. The Q outputs of decoder U9 have been re-assigned to match the codes provided by the Up/Down Counter board. Therefore, the U9 output Q0 now controls the new 10 digit (U11).

1.7.2 TYPE 796022 1 Hz TUNING 3rd LO (1 Hz-A2)

This circuit board is the only 1 Hz Option board that is completely new. The circuit provides the variable 3rd LO signal which is controlled by the 10 frequency data from the Manual Tuning Up/Down Counter, type 796014. The circuit uses two phase locked loops to produce the LO output signal. Refer to Figure 1-5. The upper loop is programmed by the 10 frequency bits, and produces a frequency ranging from 4.991 MHz to 5.000 MHz, in 1 kHz increments. This signal is divided by one thousand and applied to the lower loop to fine-tune the frequency of a crystal-controlled oscillator. The resulting output frequency ranges from 11.154991 MHz to 11.155000 MHz, in 1 Hz increments. The schematic diagram for this circuit is Figure 1-13. For more information on phase locked loops, refer to "PHASE LOCK LOOPS" in the WJ-8718 manual.

The oscillator for the upper loop is formed by Q1, CR1 and their associated components. The tuning capacitance exhibited by CR1 is a function of the dc voltage applied by the integrator circuit of U1C. Zener diode VR1 restricts the maximum positive swing to approximately 8 volts. Capacitor C1 allows adjustment of the tank circuit, while C32, C35 and C36 provide temperature compensation. The oscillator signal is buffered by Q1 and applied to the clock 1 input of counter U2. Together, U2, U3, and U4 form a programmable divider. U2 divides by 10, U3A divides by 10, U3B divides by 10, and U4 divides by 5. At the start of each counting cycle, the binary number applied to the D, C, B, and A inputs of U2 (the 10 digit) presets U2 to begin counting up from that number. Therefore, the first output pulse from U2 may represent from 0 to 9 input pulses. Thereafter, U2 divides by 10 until the next cycle begins, so the total divide ratio is programmable from 4991 to 5000. The 50 kHz reference frequency, from pin 3, is divided to 1 kHz (÷50) by the combined action of U5B/U5A. If the oscillator frequency (from Q1) is exactly correct, the divided-down output from U4, pin 5, will also be 1 kHz. If the phase and frequency of this signal do not match the 1 kHz reference, one of the normally high outputs of U1A (U1 and D1) will produce logic low pulses. This allows current pulses to flow in either CR2 or CR3, illuminating LED CR4 and signifying "unlock" condition. These pulses are also applied to charge pump U1B, which inverts the polarity of pulses applied to the PD (pump down) input. These pulses are applied to the integrator (low-pass filter) circuit of U1C. The dc output from this circuit is approximately 3.5 volts in the "locked" condition, and will swing less positive (toward 1 volt) to lower the VCO frequency, and more positive (toward 8 volts) to increase the VCO frequency. Each terminal count output from U4 pin 5 resets U4 and presets U2, so the counting cycle repeats at a rate of approximately 1 kHz.

The VCO signal from the upper loop (4.991 MHz to 5.000 MHz) is applied to decade counter U6 at pin 6. The combined function of U6, U7A and U7B is to divide by 1000, so the resulting signal applied to U8A pin 3 ranges from 4.991 kHz to 5.000 kHz. The oscillator for the lower loop is formed by Q5, CR8, Y1 and their associated components. The oscillator is crystal-controlled to 11.155 MHz, and will be "pulled" off frequency by the dc tuning voltage applied to CR1. The oscillator signal is buffered by emitter-follower Q4 and is split into two paths. One path is to board pin 7, the Third LO output. The other path is to flip-flop U9 via amplifier Q3. The flip-flop acts as a digital mixer, producing an output equal to the difference between the VCO frequency (11.154991 MHz to 11.155000 MHz) and the frequency that is the nearest integral multiple of the clock frequency (223 x 50 kHz = 11.15 MHz). The difference equals 4.991 to 5.000 kHz. This signal is applied to phase detector U8A, pin 1. The frequency of the VCO will therefore be controlled by the 4.991 kHz to 5.000 kHz signal supplied from the upper loop, via U7B, with U8B operating as the charge pump, and U8C operating as the integrator. As the upper loop is programmed to a new frequency step, phase detector U8A, B, and C will drive the lower loop VCO to the correct frequency, and the digital mixer output will change, locking the loop.

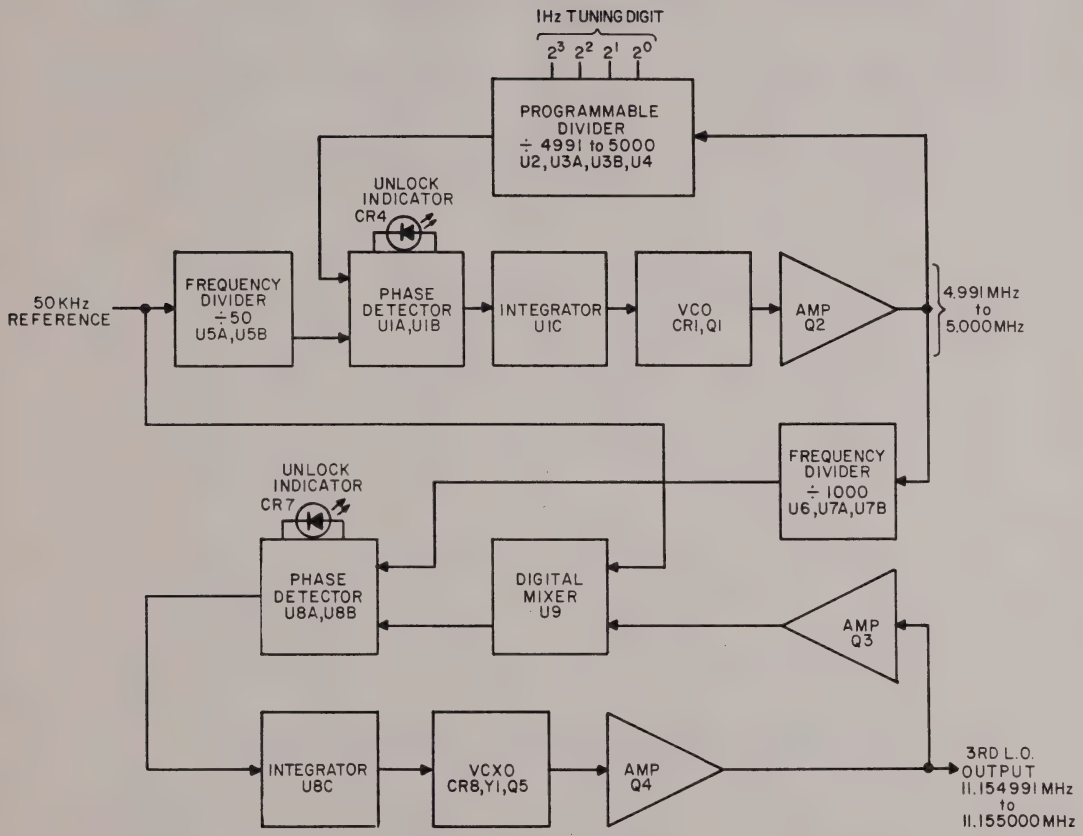

1Hz TUNING DIGIT
2^3 2^2 2^1 2^0
PROGRAMMABLE DIVIDER ÷ 4991 to 5000 U2, U3A, U3B, U4
UNLOCK INDICATOR CR4
50 KHz REFERENCE
FREQUENCY DIVIDER ÷50 U5A, U5B
PHASE DETECTOR U1A, U1B
INTEGRATOR U1C
VCO CR1, Q1
AMP Q2
4.991 MHz to 5.000 MHz
FREQUENCY DIVIDER ÷ 1000 U6, U7A, U7B
UNLOCK INDICATOR CR7
PHASE DETECTOR U8A, U8B
DIGITAL MIXER U9
AMP Q3
INTEGRATOR U8C
VCXO CR8, Y1, Q5
AMP Q4
3RD L.O. OUTPUT 11.154991 MHz to 11.155000 MHz

Figure 1-5. 1 Hz Tuning 3rd LO Functional Block Diagram

1.8 MAINTENANCE

No individual maintenance procedures are required for WJ-8718/1 Hz assemblies 1 Hz-A1, 1 Hz-A3, and 1 Hz-A4. A troubleshooting test and an alignment procedure for Type 796022, 1 Hz Tuning 3rd LO (1 Hz-A2), are provided below.

1.8.1 1 Hz TUNING 3RD LO TROUBLESHOOTING TEST

Troubleshooting the 1 Hz Tuning 3rd LO board is required when either phase lock loop cannot be adjusted to lock, or the correct output frequency cannot be obtained.

1. Check LED indicators CR4 and CR7 to determine if either is illuminated, indicating an unlocked condition in their respective loops. If only CR7 is illuminated, proceed to step 6. If both CR4 and CR7 are illuminated, continue.

2. If both loops are unlocked, check for the presence of the reference frequency (50 kHz) at board pin 3. If not present, check the wiring to the 1st and 3rd LO/Time Base (A5A1).

3. If the reference frequency is present, the problem is probably in the upper (programmable) loop. Tune the receiver to 15.000000 MHz and check the programmable divider circuit. The input frequency to U2, pin 8, should be exactly 5000 times the output frequency from U4, pin 5. If not, troubleshoot the counter IC's U2, U3, and U4.

4. If the divider circuit is operating properly, check the output voltage of the phase detector/integrator circuit, at U1, pin 8. This voltage should be either approximately 1 volt (extreme of lower swing) or approximately 8 volts (extreme of upper swing). If not, troubleshoot the phase detector/integrator circuit of U1A, B,and C.

5. If the phase detector output voltage is at one extreme (normal for a constant unlock condition) the problem is probably in the VCO circuit of Q1, CR1.

6. If only CR7 is illuminated, the problem is in the lower loop. Tune the receiver to 15.000000 MHz and check the output frequency from the fixed divider at U7, pin 13. The frequency should be 5 kHz. If not, troubleshoot the 1000 circuit of U6, U7.

7. If the frequency from U7 is correct, check the output voltage from the phase detector/integrator at U8, pin 8. This voltage should be either approximately 1 volt (extreme of lower swing) or approximately 5 volts (extreme of upper swing). If not, troubleshoot the phase detector/integrator circuit of U8A, B, and C.

8. If the phase detector output voltage is at one extreme (normal for a constant unlock condition) the problem is probably in the VCXO circuit of Q5, Y1, CR8, the buffer amplifiers Q4 and Q3, or the digital mixer (flip-flop) U9. Use the frequency counter at board pin 7 to determine if the VCXO is operating. If it is, a failure in the digital mixing circuit may be preventing the circuit from locking. Check flip-flop U9.

1.8.2 1 Hz TUNING 3rd LO ALIGNMENT

1. Mount the 1 Hz Tuning 3rd LO on an extender card and connect a digital voltmeter to U1, pin 8.

2. Tune the receiver to 15.000005 MHz.

3. Adjust C1 to produce a reading of approximately 4.5 Vdc on the voltmeter. If not obtainable, proceed to 1.8.2.

4. Tune the receiver over the range 15.000000 to 15.000009 MHz. The voltage should swing over the range of approximately 3.5 Vdc to approximately 5.5 Vdc over this range.

5. Tune the receiver to 15.000005 MHz, and connect the voltmeter to U8, pin 8.

6. Adjust C14 to produce a reading of approximately 3 Vdc on the voltmeter. If not obtainable, proceed to 1.8.2.

7. Connect a frequency counter to the 3rd LO output, at board pin 7.

8. Tune the receiver over the range 15.000000 MHz to 15.000009 MHz. The 3rd LO frequency should vary over the range of 11.155000 MHz to 11.154991 MHz. If so, the 1 Hz Tuning 3rd LO alignment is completed. If not, proceed to 1.8.2.

1.9 REPLACEMENT PARTS LISTS AND SCHEMATIC DIAGRAMS

The following list of manufacturers, parts lists, and schematic diagrams are intended as a supplement to the WJ-8718 Instruction Manual, and are to be used in conjunction with the applicable sections of that manual.

Mfr. Code	Name and Address
87014	Magnuson Prod. Corp. 50 Court Street Brooklyn, NY 11201

1.10 TYPE WJ-8718/1 Hz TUNING OPTION

REF DESIG	DESCRIPTION	QTY. PER ASSY.	MANUFACTURER'S PART NO.	MFR. CODE	RECM. VENDOR
1 Hz-A1	Manual Tuning Up/Down Counter	1	796014	14632	
1 Hz-A2	1 Hz Tuning 3rd LO	1	796022	14632	
1 Hz-A3	Frequency Display	1	796008	14632	
1 Hz-A4	Manual Tuning Module	1	791874-2	14632	
1 Hz-P1	Connector, Plug	2	UG1466/U	80058	19505
1 Hz-P2	Connector, Housing	2	87499-5	00779	
1 Hz-P3	Same as 1 Hz-P1				
1 Hz-P4	Same as 1 Hz-P1				
1 Hz-W1	Cable Assembly	1	380050-1	14632	
1 Hz-W2	Cable Assembly	1	380050-2	14632	

1.10.1 TYPE 796014 MANUAL TUNING UP/DOWN COUNTER REF DESIG PREFIX 1 Hz-A1

REF DESIG	DESCRIPTION	QTY. PER ASSY.	MANUFACTURER'S PART NO.	MFR. CODE	RECM. VENDOR
BT1	Battery, NI-CAD: 2.V V	1	41B901BD16G1	19209	
C1	Capacitor, Electrolytic, Tantalum: 22 µF, 10%, 15 V	1	CS13BD226K	81349	56289
C2	Capacitor, Ceramic, Disc: 470 pF, 20%, 1000 V	1	B470PFM	91418	
C3	Capacitor, Ceramic, Disc: 0.01 µF, 20%, 50 V	5	34453-1	14632	
C4 Thru C7	Same as C3				
CR1	Diode	1	5082-2900	28480	
--	Cable Assembly	1	34457-1	14632	
J1	Connector, Paddle Board	1	88139-1	00779	
--	Connector, Receptacle, Multipin	1	86896-2	00779	
J2	Connector, Receptacle, Header Assembly	3	86567-4	00779	
J3	Same as J2				
J4	Same as J2				
Q1	Transistor	1	2N2222A	80131	04713
--	Transipad	1	7717-44DAP	13103	
R1	Resistor, Fixed, Composition: 10 kΩ, 5%, 1/4 W	7	RCR07G103JS	81349	01121
R2	Same as R1				
R3	Resistor, Fixed, Composition: 4.7 Ω, 5%, 1/4 W	1	RCR07G4R7JS	81349	01121
R4	Resistor, Fixed, Composition: 1.0 kΩ, 5%, 1/4 W	3	RCR07G102JS	81349	01121
R5 Thru R8	Same as R1				
R9	Resistor, Fixed, Composition: 470 Ω, 5%, 1/4 W	1	RCR07G471JS	81349	01121
R10	Same as R1				
R11	Same as R4				
R12	Resistor, Fixed, Composition: 100 Ω, 5%, 1/4 W	1	RCR07G101JS	81349	01121
R13	Same as R4				
R14	Resistor, Fixed, Composition: 470 kΩ, 5%, 1/4 W	1	RCR07G474JS	81349	01121
U1	Integrated Circuit	1	MM74C14N	27014	
U2	Integrated Circuit	7	MC14510BCP	04713	
U3 Thru U7	Same as U2				
U8	Integrated Circuit	3	MC14081BCP	04713	
U9	Integrated Circuit	1	MC14027BCP	04713	
U10	Integrated Circuit	1	MC14070BCP	04713	
U11	Same as U8				
U12	Integrated Circuit Selector	4	MC14512CP	04713	
U13	Same as U12				
U14	Same as U12				
U15	Same as U12				
U16	Integrated Circuit	1	MC14520BCP	04713	

REF DESIG PREFIX 1 Hz-A1

REF DESIG	DESCRIPTION	QTY. PER ASSY.	MANUFACTURER'S PART NO.	MFR. CODE	RECM. VENDOR
U17	Integrated Circuit	1	MC14050BCP	04713	
U18	Same as U8				
U19	Same as U2				

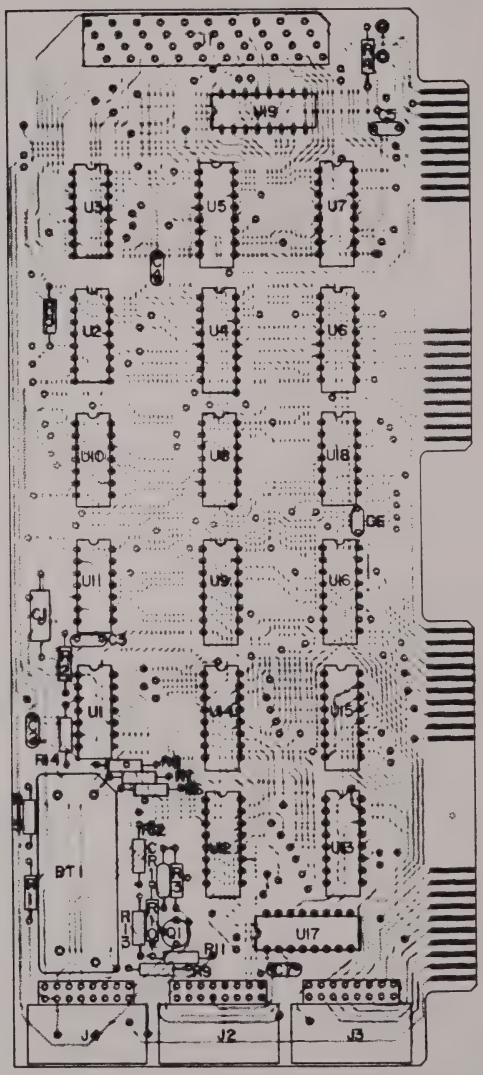


Figure 1-6. Type 796014 Manual Tuning Up/Down Counter (1 Hz-A1), Location of Components

1.10.2 TYPE 796022 1 Hz TUNING 3rd LO REF DESIG PREFIX 1 Hz-A2

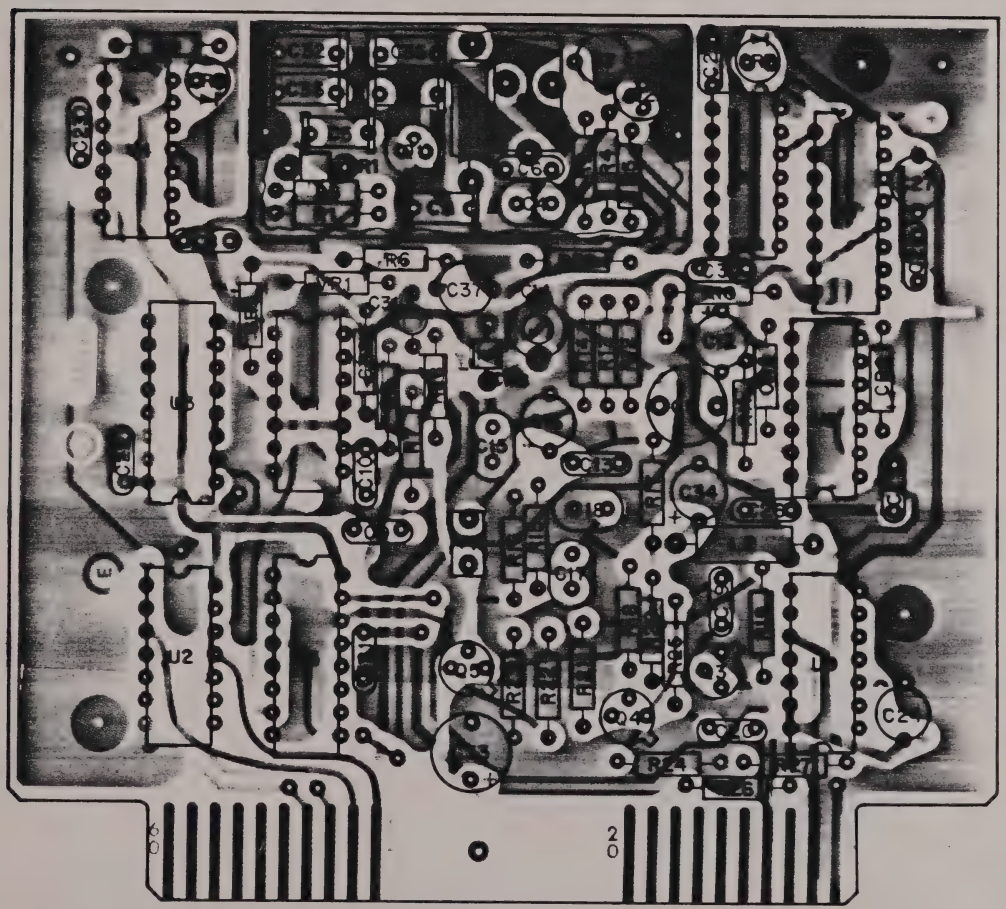
REF DESIG	DESCRIPTION	QTY. PER ASSY.	MANUFACTURER'S PART NO.	MFR. CODE	RECM. VENDOR
C1	Capacitor, Variable, Air: 0.8-10 pF, 250 V	1	5201	91293	
C2	Capacitor, Ceramic, Tubular: 47 pF, 5%, 500 V	2	308-000C0G0-470J	72982	
C3	Same as C2				
C4	Capacitor, Mica, Dipped: 100 pF, 2%, 500 V	1	CM04FD101G03	81349	72136
C5	Capacitor, Ceramic, Tubular: 6.8 pF±0.25 pF, 500 V	1	301-000C0H0-689C	72982	
C6	Capacitor, Ceramic, Disc: 0.01 µF, 20%, 50 V	14	34453-1	14632	
C7	Capacitor, Electrolytic, Tantalum: 27 µF, 10%, 35 V	1	196D276X9035TE4	56289	
C8	Same as C6				
C9	Capacitor, Ceramic, Disc: 0.47 µF, 20%, 50 V	1	34452-1	14632	
C10	Same as C6				
C11	Capacitor, Electrolytic, Tantalum: 220 µF, 20%, 10 V	2	196D227X0010TE4		
C12	Capacitor,Electrolytic, Tantalum: 2.2 µF, 20%, 35 V	1	196D225X0035JE3		
C13	Same as C6				
C14	Capacitor, Variable, Ceramic: 2.5-9 pF, 25 V	1	518-000A2.5-9		
C15	Capacitor, Mica, Dipped: 18 pF, 5%, 500 V	1	CM04CD180J03	81349	72136
C16	Capacitor, Electrolytic, Tantalum: 22 µF, 20%, 10 V	5	196D226X0010JE3	56289	
C17	Capacitor, Mica, Dipped: 220 pF, 2%, 500 V	1	CM04FD221G03	81349	72136
C18	Same as C17				
C19 Thru C23	Same as C6				
C24	Same as C16				
C25	Same as C6				
C26	Same as C6				
C27	Same as C16				
C28 Thru C30	Same as C6				
C31	Capacitor, Electrolytic, Tantalum: 1 µF, 20%, 35 V	1	196D105X0035HE3	56289	
C32	Capacitor, Ceramic, Tubular: 2.7 pF±0.25 pF, 500 V	1	301-000U2J0-279C	72982	
C33	Same as C11				
C34	Same as C16				
C35	Capacitor, Ceramic, Tubular: 10 pF±0.5 pF, 500 V	2	301-000P3K0-100D	72982	
C36	Same as C35				
C37	Same as C16				
CR1	Diode, Varicap	1	BB109-YELLOW	25088	
CR2	Diode	4	1N995	80131	93332
CR3	Same as CR2				
CR4	Diode: LED (Red)	2	5082-4684	28480	
CR5	Same as CR2				
CR6	Same as CR2				
CR7	Same as CR4				

REF DESIG PREFIX 1 Hz-A2

REF DESIG	DESCRIPTION	QTY. PER ASSY.	MANUFACTURER'S PART NO.	MFR. CODE	RECM. VENDOR
CR8	Diode, Varicap	1	BB105B	25088	
L1	Coil, Fixed: 18 µH	1	1537-42	99800	
L2	Coil, Fixed: 100 µH	1	1537-76	99800	
MP1	Cover Assembly	1	24469-4	14632	
Q1	Transistor	1	U310	17856	
Q2	Transistor	4	2N706	80131	04713
Q3	Same as Q2				
Q4	Same as Q2				
Q5	Same as Q2				
R1	Resistor, Fixed, Composition: 220 Ω, 5%, 1/4 W	2	RCR07G221JS	81349	01121
R2	Resistor, Fixed, Composition: 10 Ω, 5%, 1/4 W	3	RCR07G100JS	81349	01121
R3	Resistor, Fixed, Composition: 10 kΩ, 5%, 1/4 W	3	RCR07G103JS	81349	01121
R4	Resistor, Fixed, Composition: 5.1 kΩ, 5%, 1/4 W	1	RCR07G512JS	81349	01121
R5	Resistor, Fixed, Composition: 1.0 kΩ, 5%, 1/4 W	4	RCR07G102JS	81349	01121
R6	Resistor, Fixed, Composition: 1.5 kΩ, 5%, 1/4 W	1	RCR07G152JS	81349	01121
R7	Resistor, Fixed, Composition: 910 kΩ, 5%, 1/4 W	1	RCR07G914JS	81349	01121
R8	Resistor, Fixed, Composition: 910 Ω, 5%, 1/4 W	2	RCR07G911JS	81349	01121
R9	Resistor, Fixed, Composition: 470 Ω, 5%, 1/4 W	3	RCR07G471JS	81349	01121
R10	Same as R9				
R11	Resistor, Fixed, Composition: 4.3 kΩ, 5%, 1/4 W	1	RCR07G432JS	81349	01121
R12	Same as R9				
R13	Same as R5				
R14	Same as R3				
R15	Same as R5				
R16	Same as R3				
R17	Resistor, Fixed, Composition: 100 Ω, 5%, 1/4 W	1	RCR07G101JS	81349	01121
R18	Resistor, Fixed, Composition: 27 Ω, 5%, 1/4 W	1	RCR07G270JS	81349	01121
R19	Same as R1				
R20	Same as R5				
R21	Resistor, Fixed, Composition: 22 Ω, 5%, 1/4 W	2	RCR07G220JS	81349	01121
R22	Same as R21				
R23	Resistor, Fixed, Composition: 270 Ω, 5%, 1/4 W	1	RCR07G271JS	81349	01121
R24	Resistor, Fixed, Composition: 120 Ω, 5%, 1/4 W	2	RCR07G121JS	81349	01121
R25	Same as R24				
R26	Same as R2				
R27	Same as R2				
R28	Same as R8				
R29	Resistor, Fixed, Composition: 750 Ω, 5%, 1/4 W	1	RCR07G751JS	81349	01121
U1	Integrated Circuit	2	MC4044P	04713	
U2	Integrated Circuit	3	SN74LS196N	01295	
U3	Integrated Circuit	3	SN74LS390N	01295	

REF DESIG PREFIX 1 Hz-A2

REF DESIG	DESCRIPTION	QTY. PER ASSY.	MANUFACTURER'S PART NO.	MFR. CODE	RECM. VENDOR
U4	Same as U2				
U5	Same as U3				
U6	Same as U2				
U7	Same as U3				
U8	Same as U1				
U9	Integrated Circuit	1	SN74LS74N	01295	
VR1	Diode, Zener: 8.2 V	1	1N756A	80131	04713
Y1	Crystal, Quartz: 11.155 MHz	1	CR64U11.155 MHz	80058	74306



1.10.3 TYPE 796008 FREQUENCY DISPLAY REF DESIG PREFIX 1 Hz-A3

REF DESIG	DESCRIPTION	QTY. PER ASSY.	MANUFACTURER'S PART NO.	MFR. CODE	RECM. VENDOR
C1	Capacitor, Ceramic, Disc: 0.01 µF, 20%, 50 V	2	34453-1	14632	
C2	Same as C1				
CR1	Diode: LED	1	5082-4190	28480	
--	Cable Assembly	1	34525-1	14632	
--	Connector, Paddle Board	1	88139-3	00779	
P1	Plug Assembly	1	88475-3	00779	
Q1	Transistor	1	T1P-29	01295	
R1	Resistor, Fixed, Composition: 47 Ω, 5%, 1/4 W	1	RCR07G470JS	81349	01121
R2	Resistor, Variable, Film: 100 Ω, 10%, 3/4 W	1	89PR100	73138	
R3	Resistor, Fixed, Composition: 820 Ω, 5%, 1/4 W	1	RCR07G821JS	81349	01121
R4	Resistor, Fixed, Composition: 200 Ω, 5%, 1/4 W	1	RCR07G201JS	81349	01121
U1	Display, LED (Green)	8	5082-7633	28480	
U2 Thru U7	Same as U1				
U8	Integrated Circuit	1	DS8857N	87014	
U9	Integrated Circuit	1	CD4028AE	02735	
U10	Integrated Circuit	1	DS8863N	87014	
U11	Same as U1				
XCR1	Receptacle Pin	2	3-116141-2	00779	
XU1	Socket, IC	7	583527-1	00779	
XU2 Thru XU7	Same as XU1				

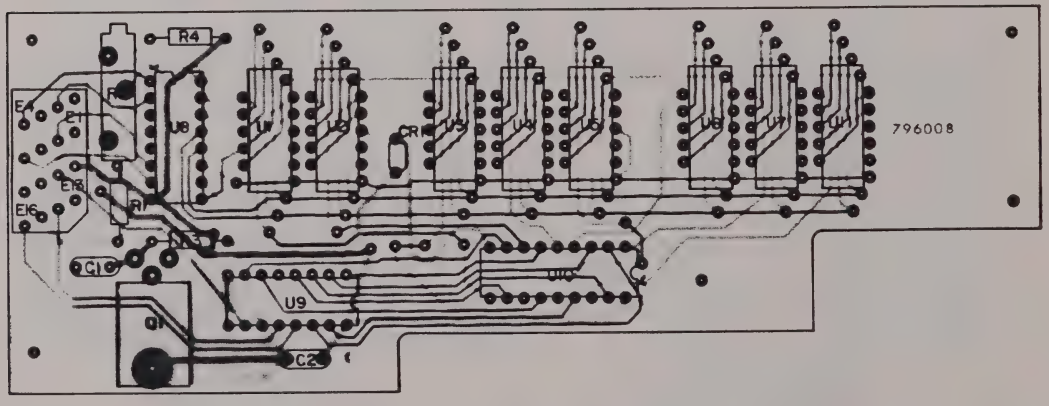


Figure 1-8. Type 796008 Frequency Display (1 Hz-A3), Location of Components

1.10.4 TYPE 791874-2 MANUAL TUNING MODULE REF DESIG PREFIX 1 Hz-A4

REF DESIG	DESCRIPTION	QTY. PER ASSY.	MANUFACTURER'S PART NO.	MFR. CODE	RECM. VENDOR
A1	Tuning Resolution	1	791589-3	14632	
MP1	Knob, Assembly	1	280064-1	14632	
MP2	Button: Black Shell w/green indicator	5	FA101-BLK W/GREEN	31918	
MP3 Thru MP6	Same as MP2				
U1	Encoder Assembly	1	34836-1	14632	

1.10.4.1 Type 791589-3 Tuning Resolution REF DESIG PREFIX 1 Hz-A4A1

REF DESIG	DESCRIPTION	QTY. PER ASSY.	MANUFACTURER'S PART NO.	MFR. CODE	RECM. VENDOR
P1	Connector, Plug Assembly	1	88475-3	00779	
--	Cable Assembly	1	380037-5	14632	
--	Connector, Paddle Board	1	88139-3	00779	
S1	Switch, Push Button	1	18488	14632	

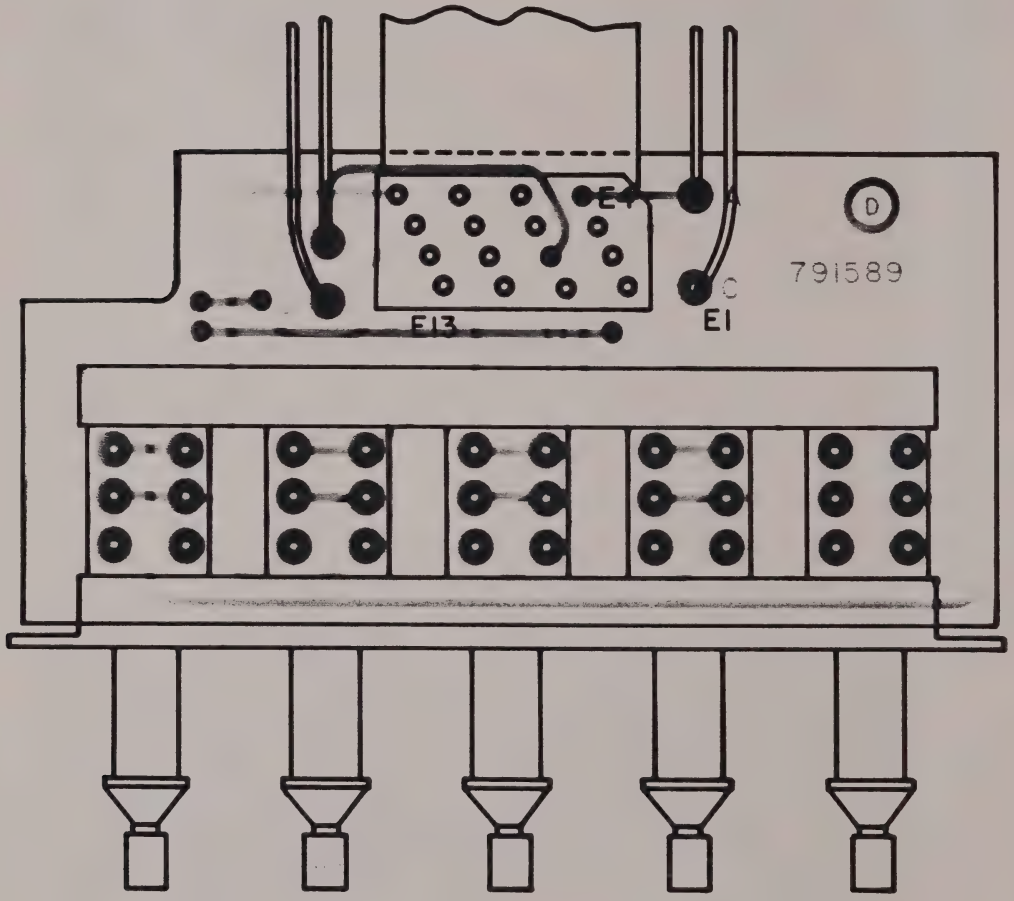


Figure 1-9. Type 791589-3 Tuning Resolution (1 Hz-A4A1), Location of Components

DD 2 IN	GND PIN	DETAIL
4	7	B
16	8	A
	7	B
	8	A

REF DESIG NOT USED

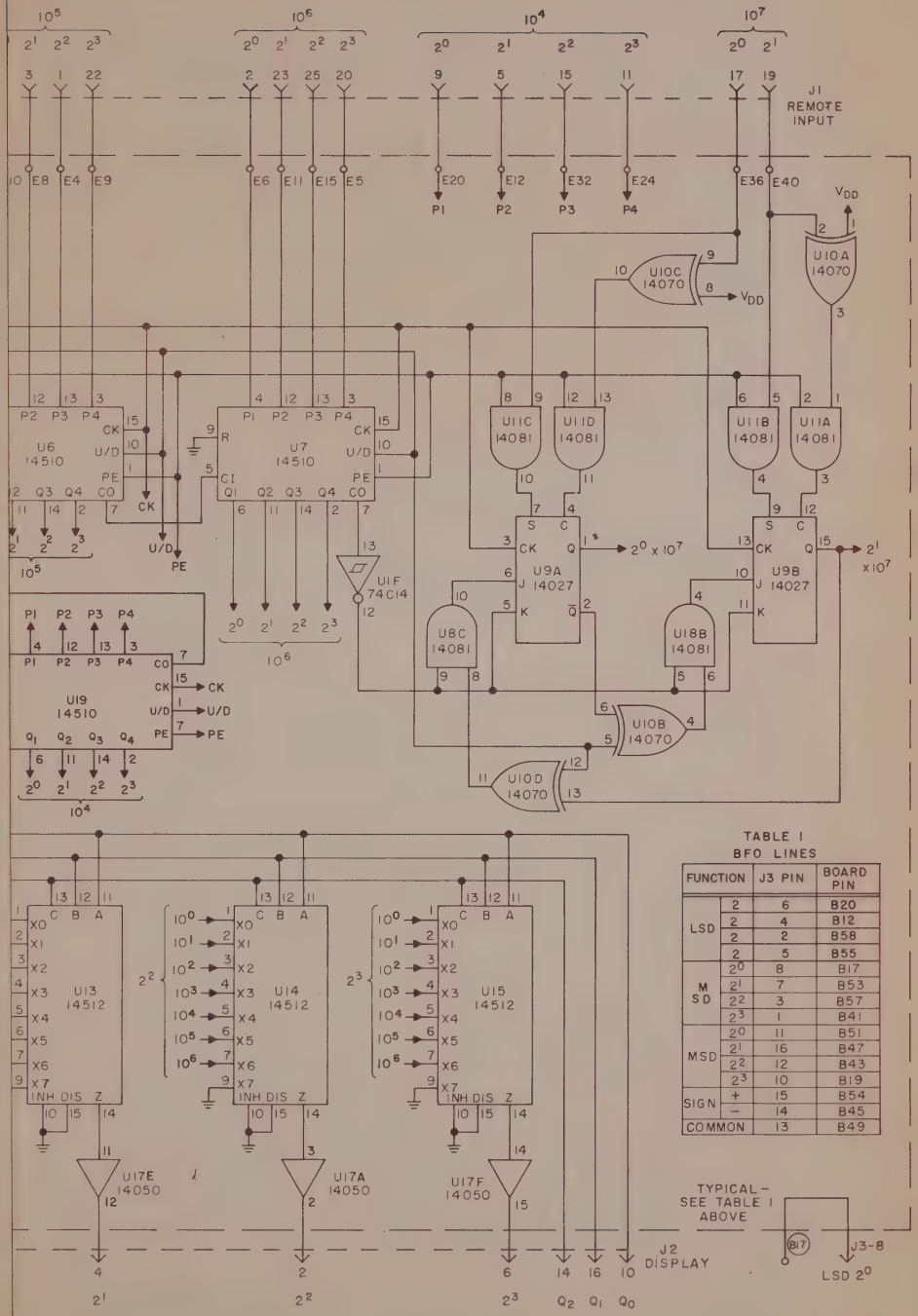


TABLE I
BFO LINES

FUNCTION		J3 PIN	BOARD PIN
LSD	2	6	B20
	2	4	B12
	2	2	B58
	2	5	B55
MSD	2^0	8	B17
	2^1	7	B53
	2^2	3	B57
	2^3	1	B41
MSD	2^0	11	B51
	2^1	16	B47
	2^2	12	B43
	2^3	10	B19
SIGN	+	15	B54
	−	14	B45
COMMON		13	B49

Figure 1-10. Type 796014 Manual Tuning Up/Down Counter (1Hz-A1), Schematic Diagram 580007

1.10.4.1 Type 791589-3 Tuning Resolution REF DESIG PREFIX 1 Hz-A4A1

REF DESIG	DESCRIPTION	QTY. PER ASSY.	MANUFACTURER'S PART NO.	MFR. CODE	RECM. VENDOR
P1	Connector, Plug Assembly	1	88475-3	00779	
--	Cable Assembly	1	380037-5	14632	
--	Connector, Paddle Board	1	88139-3	00779	
S1	Switch, Push Button	1	18488	14632	

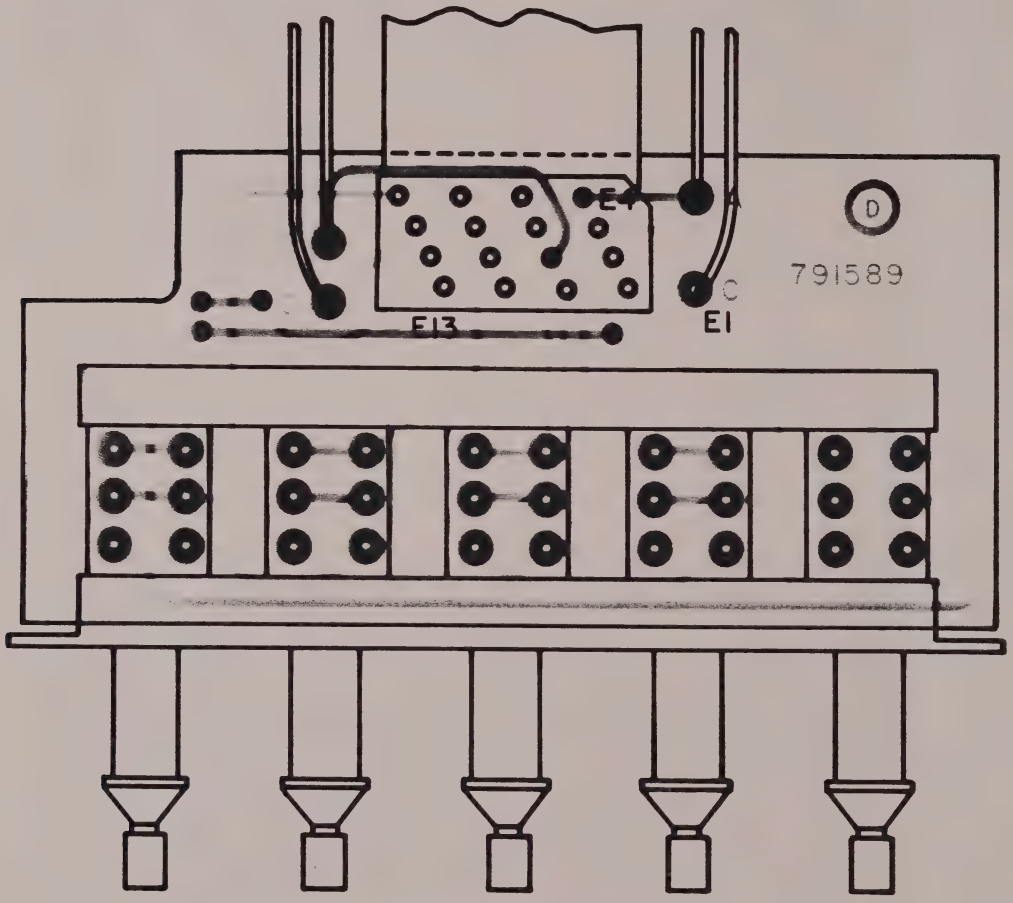


Figure 1-9. Type 791589-3 Tuning Resolution (1 Hz-A4A1), Location of Components

NOTES:
1. UNLESS OTHERWISE SPECIFIED, RESISTANCE IS IN OHMS, ±5%, 1/4W.
2. POWER CONNECTIONS AND PIN ARRANGEMENTS FOR ICs ARE GIVEN IN TABLE 2.
3. ENCIRCLED NUMBERS ARE MODULE PIN NUMBERS.
4. REMOVE JUMPER BETWEEN E42 AND E41 FOR EXTERNALLY ACTIVATED REMOTE CONTROL. THE PRESENSE OF THE JUMPER PROVIDES FRONT-PANEL ACTIVATED REMOTE CONTROL.
5. DIFFERENCE BETWEEN TYPES IS J1 REMOTE INPUT CABLE IS NOT USED ON DASH-1 VERSION

TABLE 2

IC	V_{DD} PIN	V_{DD} 2 PIN	GND PIN	DETAIL
U1, U8, U18		14	7	B
U2-U7, U9, U12-U15, U19		16	8	A
U10, U11	14		7	B
U16	16		8	A
U17	1		8	B

DETAIL A

DETAIL B

HIGHEST REF DESIG	REF DESIG NOT USED
C7	
CR1	
E42	
J4	
Q1	
R14	
U19	

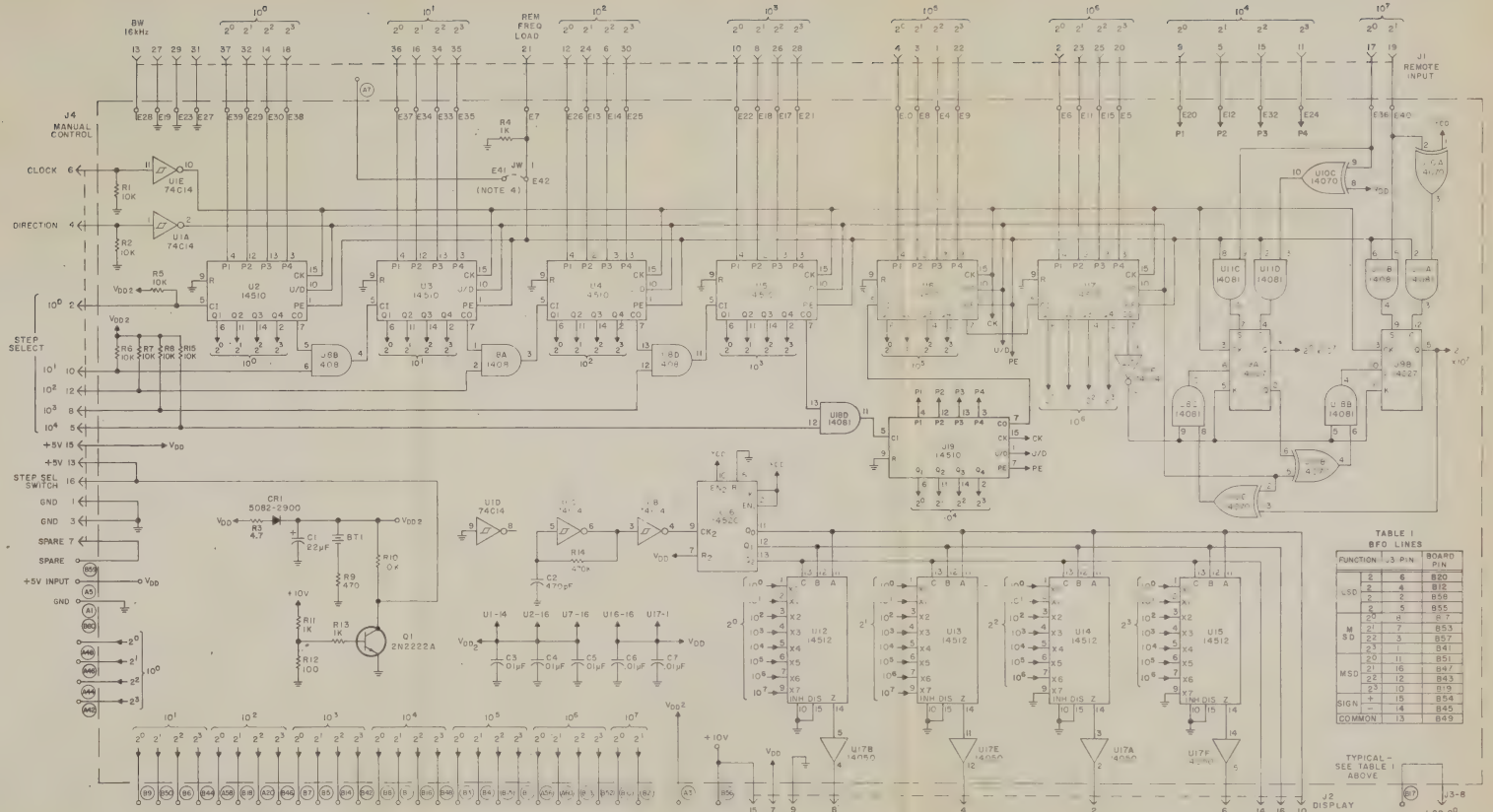
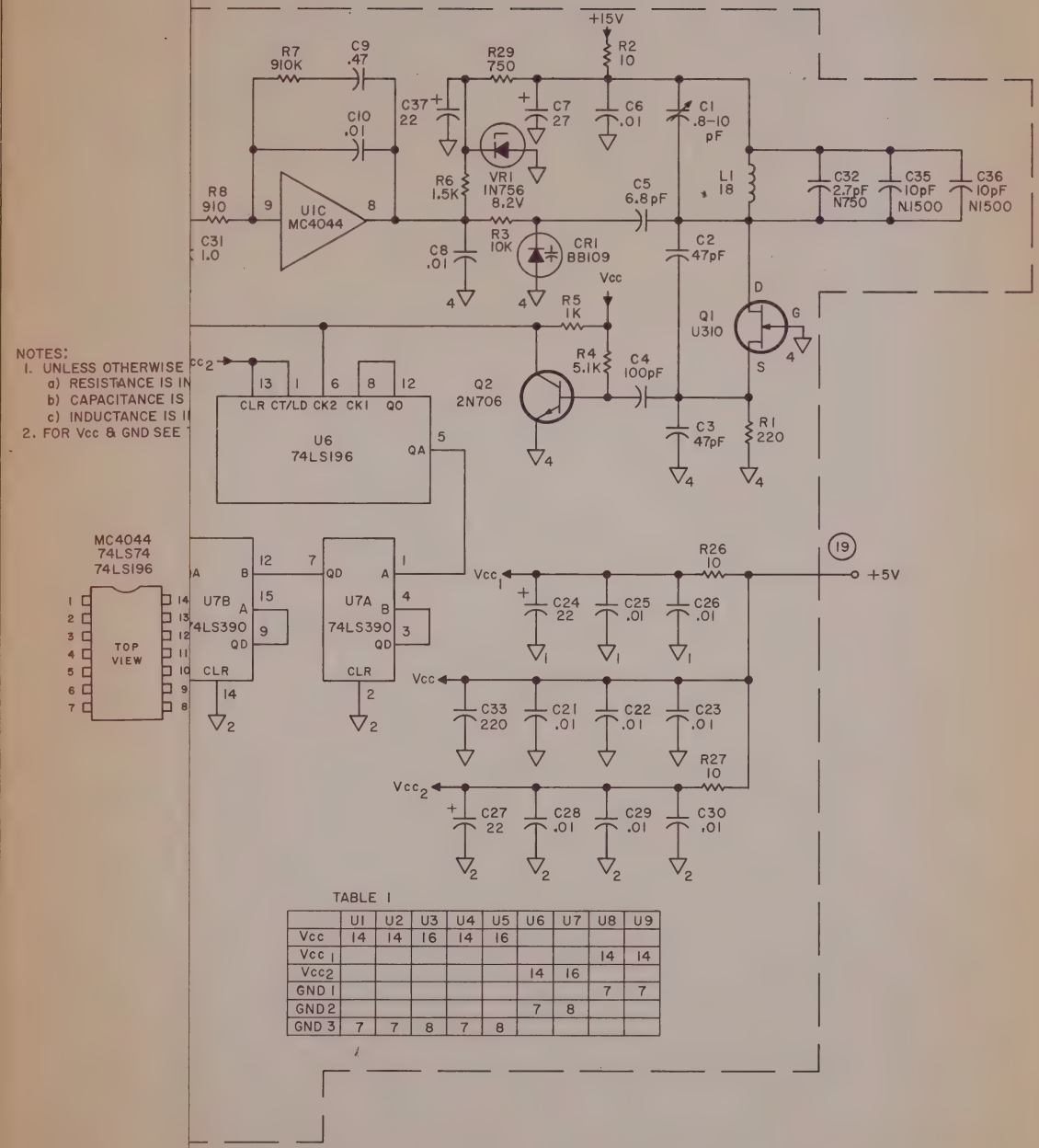


TABLE 1
BFO LINES

FUNCTION	J3 PIN	BOARD PIN
LSD	2	820
	4	812
	2	858
	2	855
	8	857
MSD	1	841
	11	851
	16	847
	12	843
	10	819
SIGN	15	854
	14	845
COMMON	13	849

TYPICAL - SEE TABLE I ABOVE

Figure 1-10. Type 796014 Manual Tuning Up/Down Counter (1Hz-A1), Schematic Diagram 580007



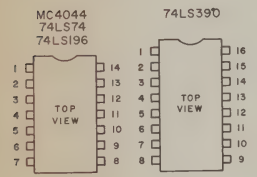
NOTES:
1. UNLESS OTHERWISE
   a) RESISTANCE IS IN
   b) CAPACITANCE IS
   c) INDUCTANCE IS I
2. FOR Vcc & GND SEE

TABLE I

	U1	U2	U3	U4	U5	U6	U7	U8	U9
Vcc	14	14	16	14	16				
Vcc 1								14	14
Vcc2						14	16		
GND 1								7	7
GND2						7	8		
GND 3	7	7	8	7	8				

Figure 1-11. Type 796022 1Hz Tuning 3rd LO (1Hz-A2), Schematic Diagram 480023

NOTES:
1. UNLESS OTHERWISE SPECIFIED:
   a) RESISTANCE IS IN OHMS, ±5%, 1/4W.
   b) CAPACITANCE IS IN µF.
   c) INDUCTANCE IS IN µH.
2. FOR Vcc & GND SEE TABLE I.



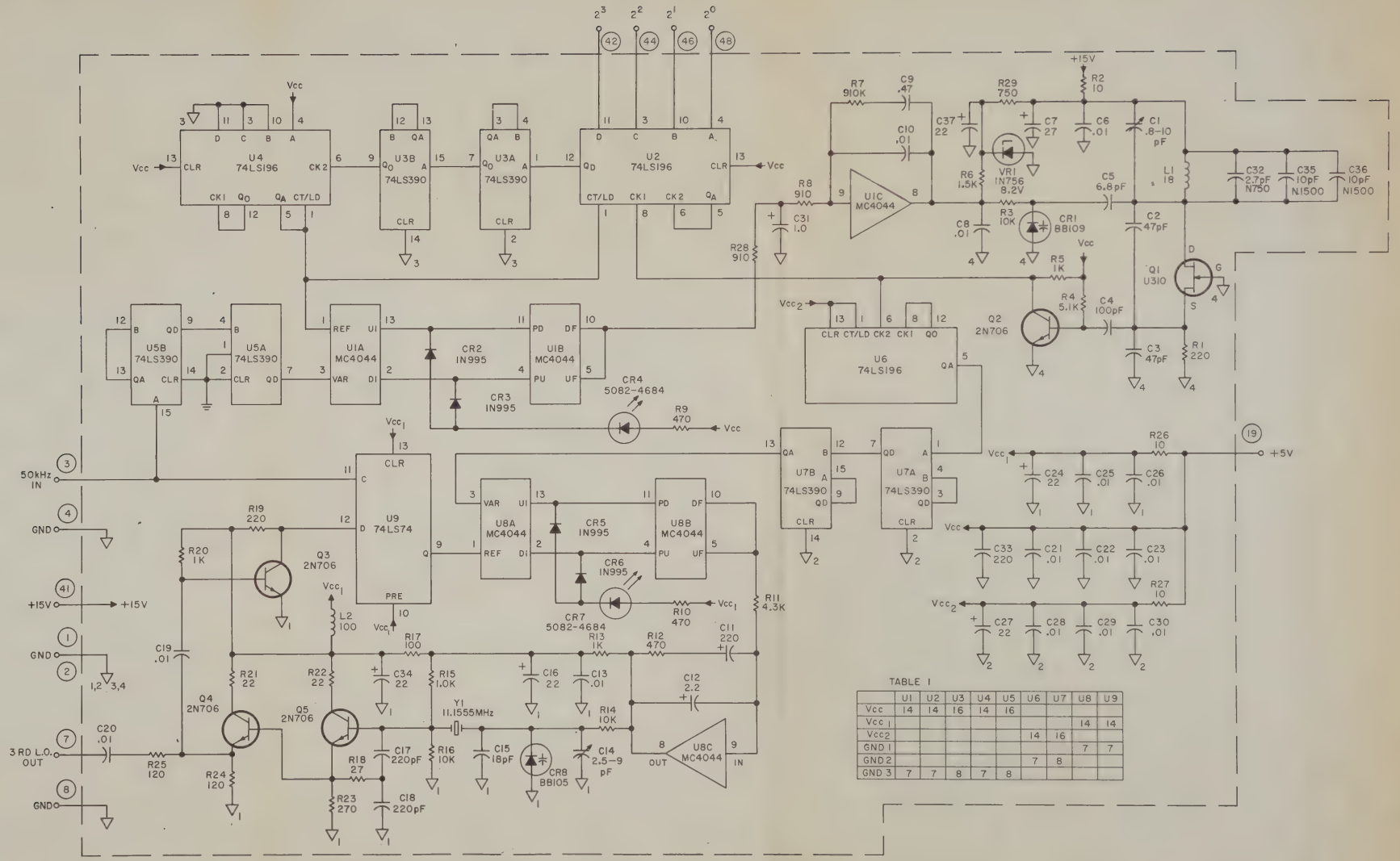


TABLE I

	U1	U2	U3	U4	U5	U6	U7	U8	U9
Vcc	14	14	16	14	16				
Vcc 1								14	14
Vcc2						14	16		
GND 1								7	7
GND 2						7	8		
GND 3	7	7	8	7	8				

Figure 1-11. Type 796022 1Hz Tuning 3rd LO (1Hz-A2), Schematic Diagram 480023

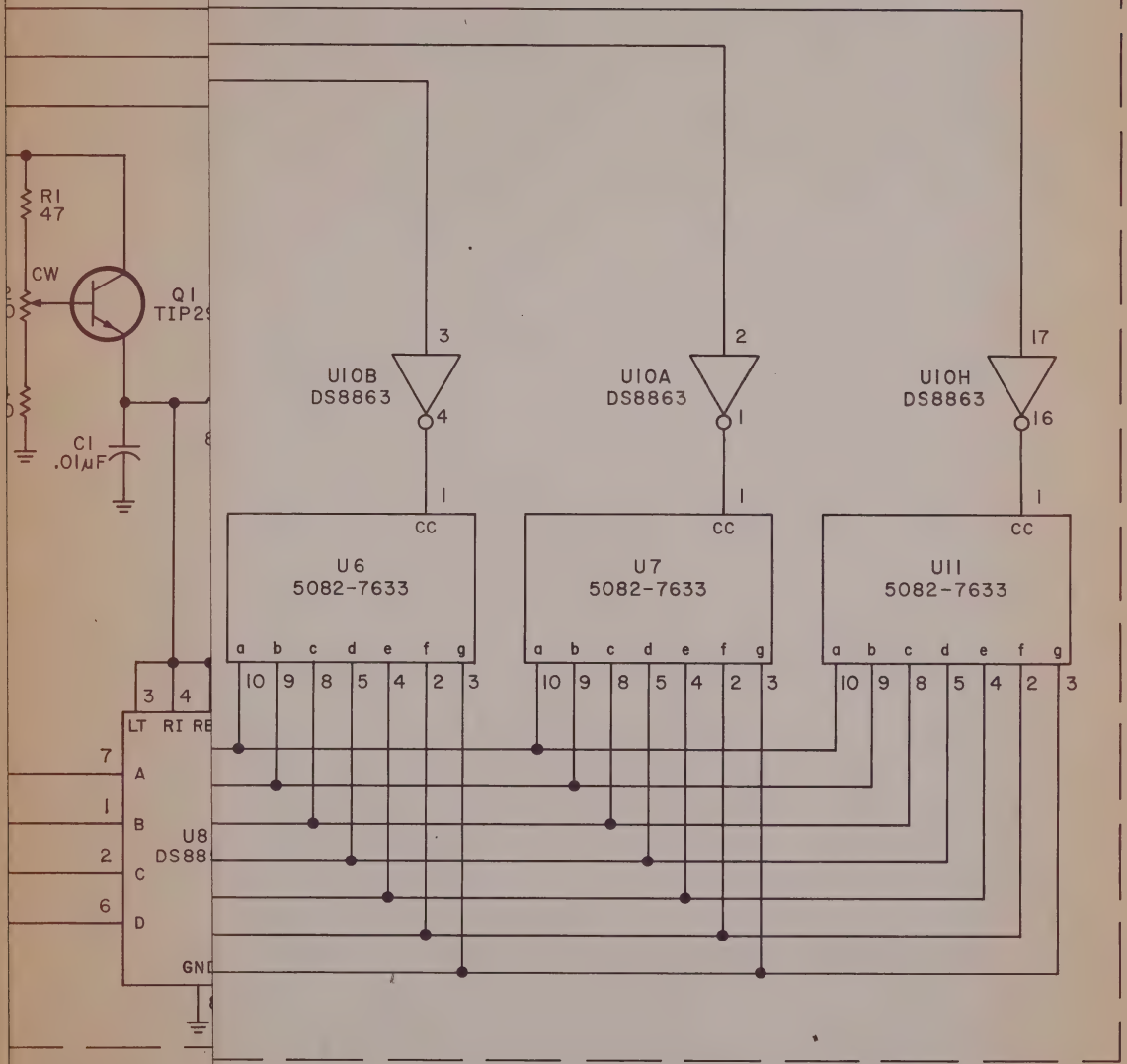
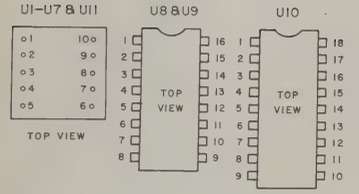


Figure 1-12. Type 796008 Frequency Display (1Hz-A3), Schematic Diagram 480011

NOTES:
1. UNLESS OTHERWISE SPECIFIED:
   a. RESISTANCE IS IN OHMS, ±5%, 1/4W.
2. U10 PIN 18 IS +5V; U10 PIN 9 IS GND.
3. PIN ARRANGEMENT FOR IC'S IS SHOWN IN DETAIL A.

DETAIL A



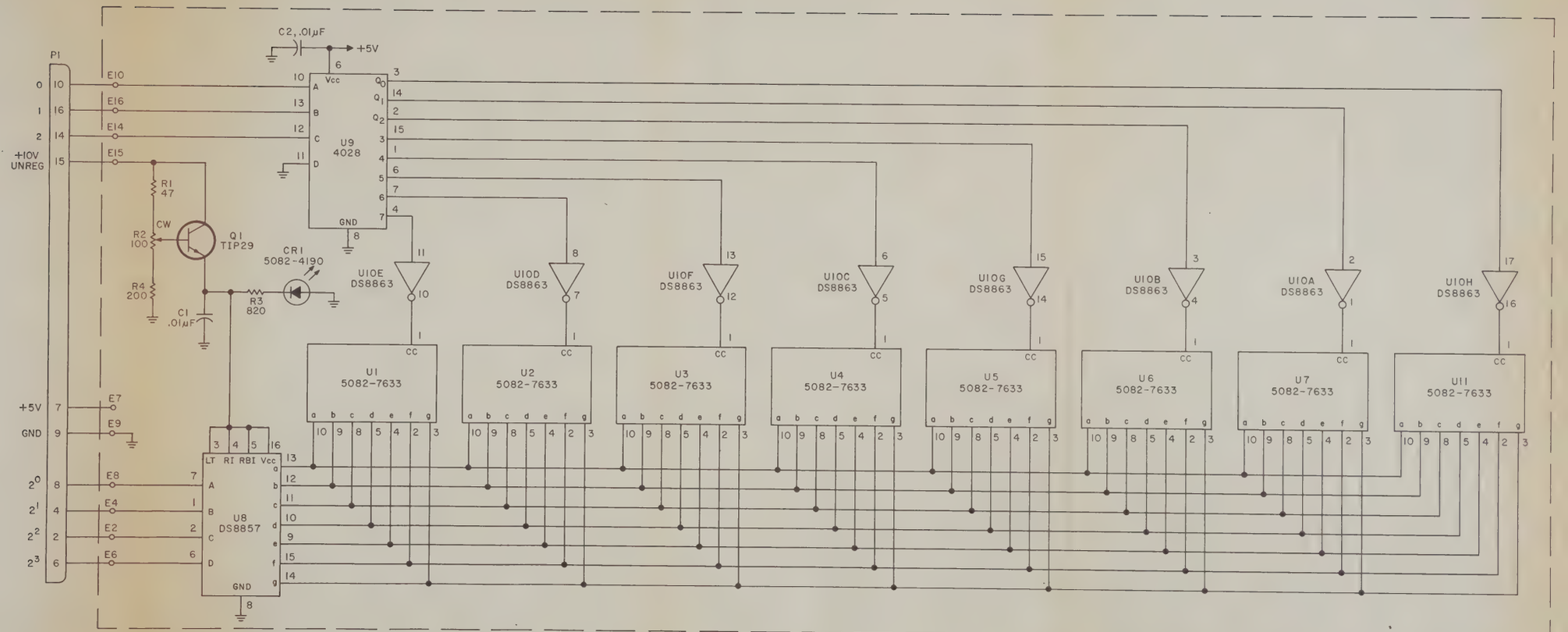


Figure 1-12. Type 796008 Frequency Display (1Hz-A3), Schematic Diagram 480011

N 8718/1Hz IS IMPLEM
TURE.
INSTRUCTION.

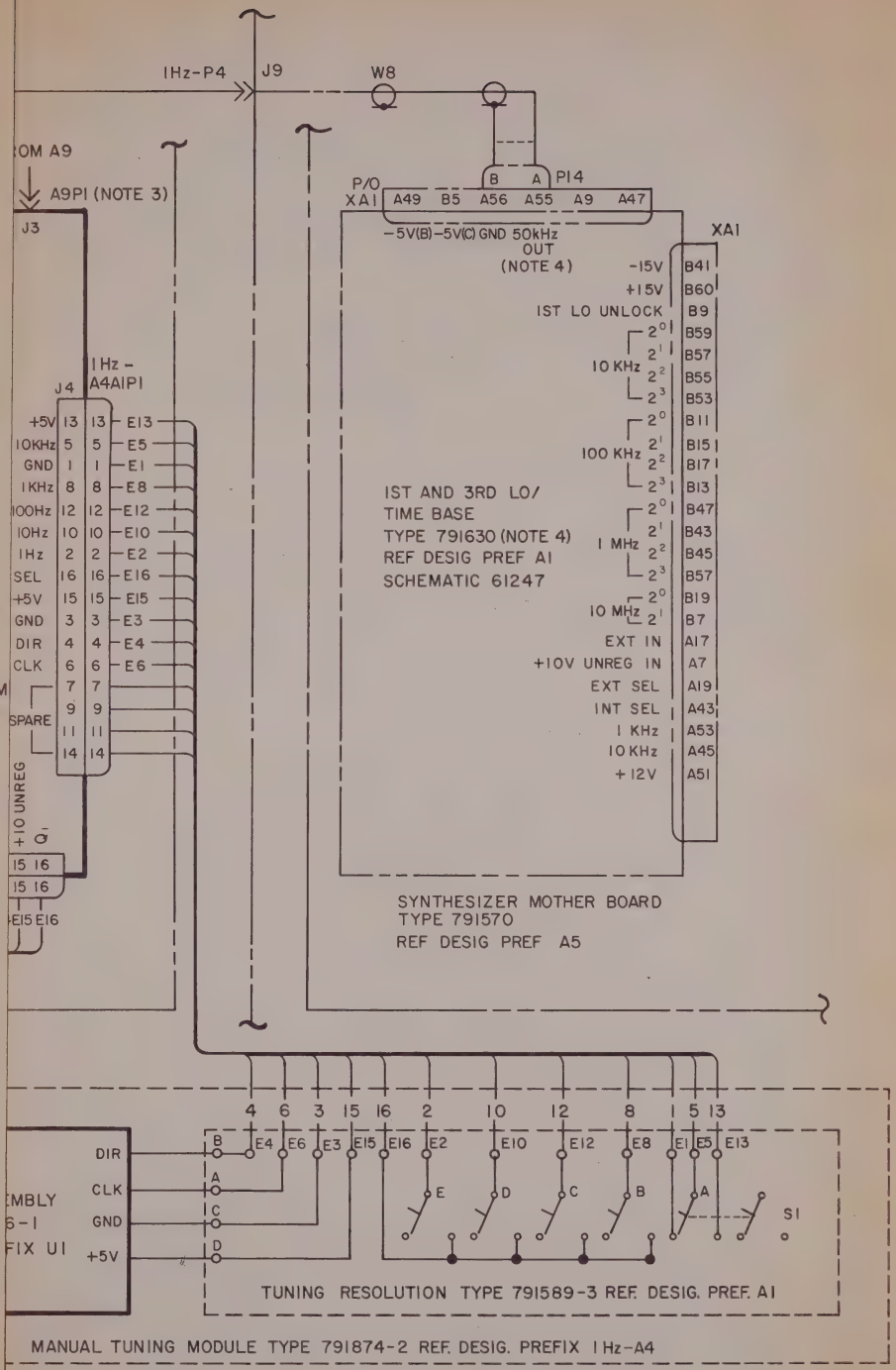


Figure 1-13. Type WJ-8718/1Hz Tuning Option, Schematic Diagram 480058

NOTES

1. PHANTOM LINES INDICATE PRE-EXISTING MODULES.
2. 1Hz-A1 REPLACES A6A1, 1Hz-A3 REPLACES A8, 1Hz-A4 REPLACES A7 OF MAIN FRAME WHEN 8718/1Hz IS IMPLEMENTED.
3. MASS TERMINATION CONNECTOR-REFER TO MAIN CHASSIS SCHEMATIC FOR PIN NOMENCLATURE.
4. MODIFY IST AND 3RD LO/TIME BASE TYPE 791630 IN ACCORDANCE WITH MODIFICATION INSTRUCTION.
5. LINES BETWEEN 1HZ-XA1A & 1HZ-XA2 ARE WIRE WRAPPED AS INDICATED.

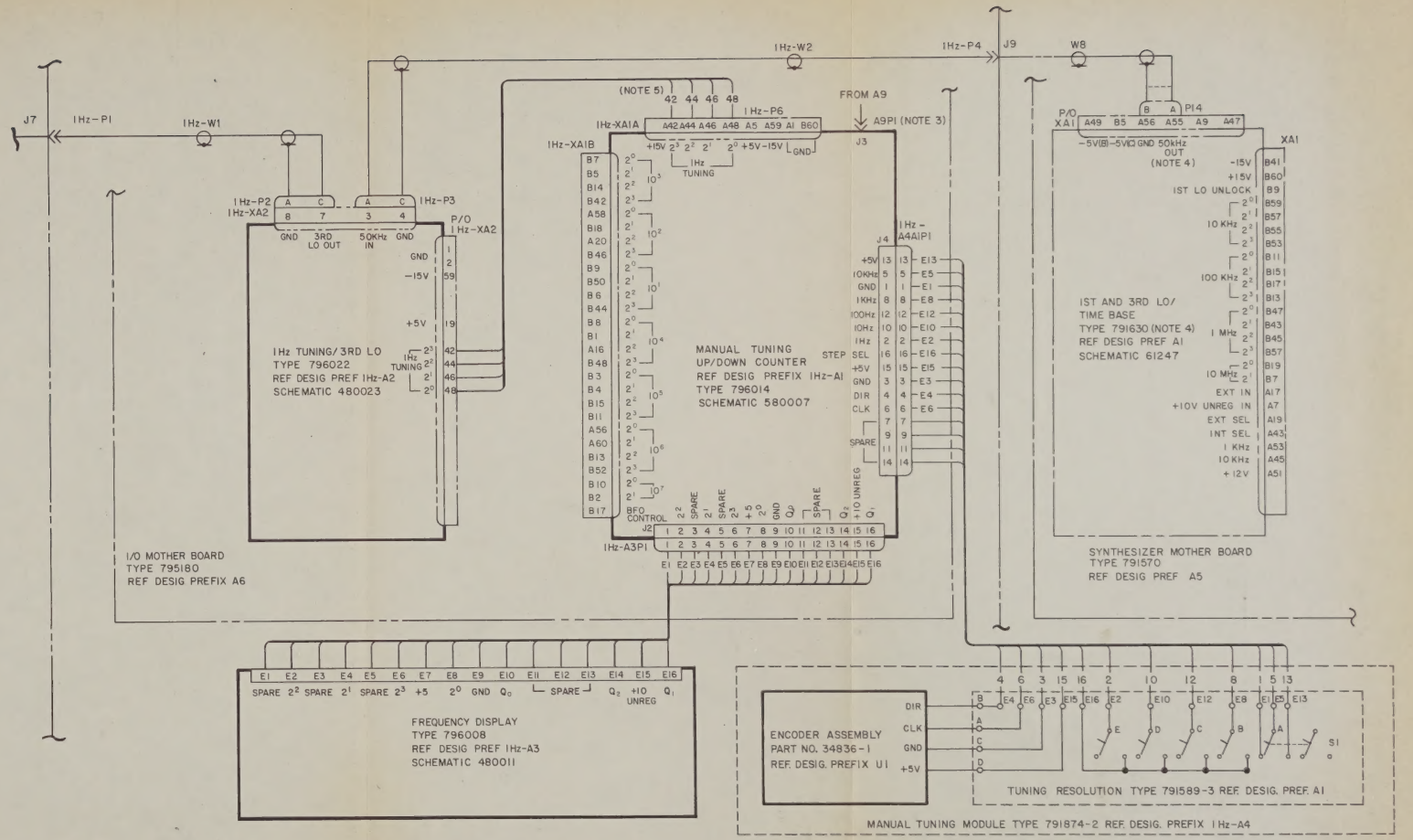


Figure 1-13. Type WJ-8718/1Hz Tuning Option, Schematic Diagram 480058